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DECEMBER 25, 1959

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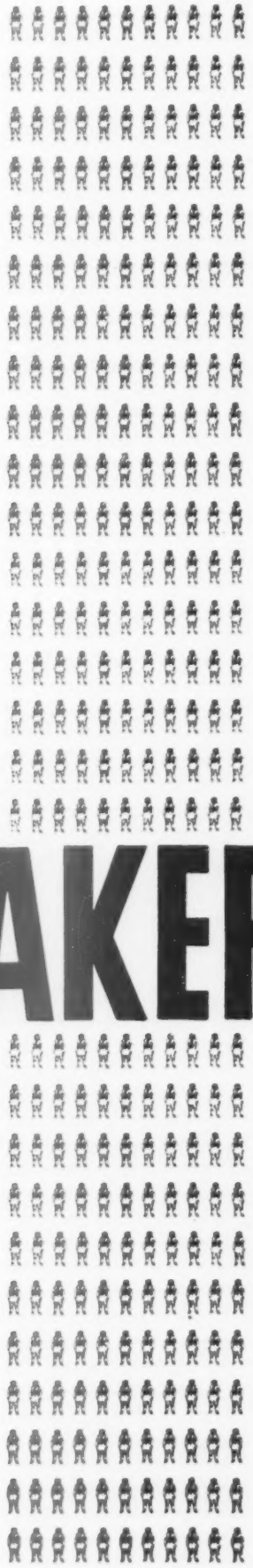

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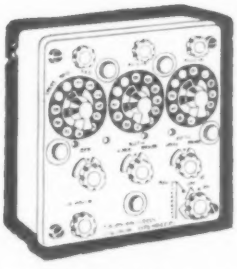

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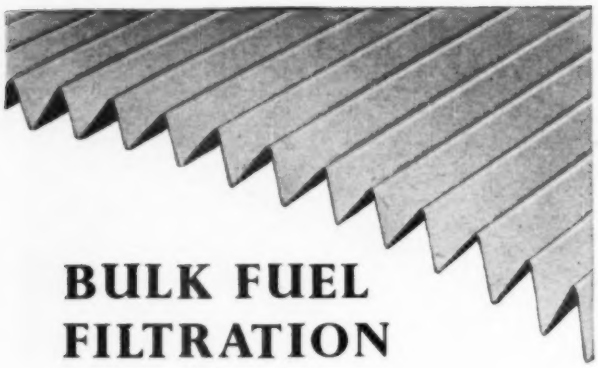

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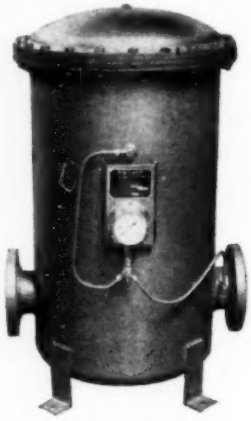

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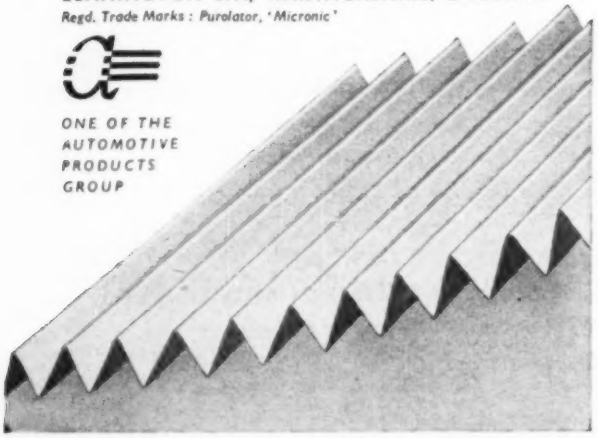

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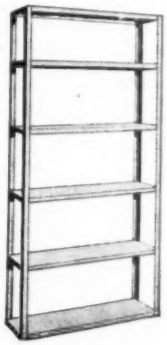

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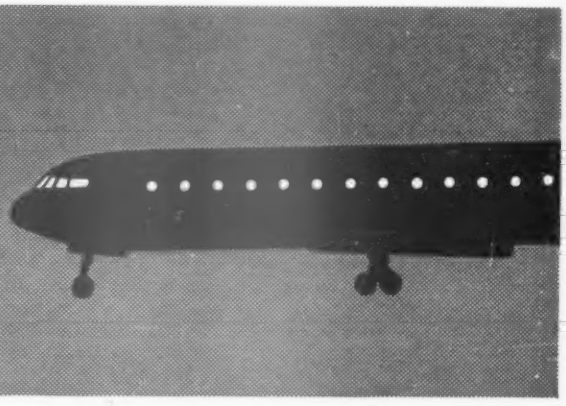

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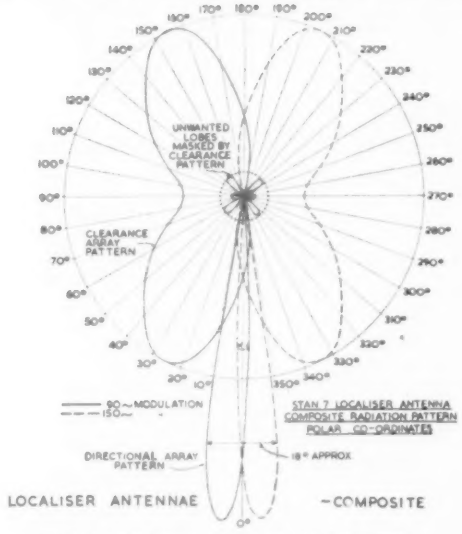

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THE AEROPLANE and ASTRONAUTICS

VOLUME 97 NUMBER 2514 DECEMBER 25, 1959

Major Moves

Although, at the time of going to press with this issue, the Minister of Aviation had made no statement regarding the aircraft industry, last week's news of the Hawker Siddeley bid for the de Havilland Enterprise, in fact, said a good deal. However, until more is known about the detailed arrangements that will need to be made in order to integrate a group the size of de Havillands into another, larger, group, the overall picture must remain far from clear. Furthermore, even though this move has to a certain extent clarified the general situation—in that one of the large regroupings which has been the subject of much speculation for a considerable time has now been formulated—it tends, if anything, to make the detail pattern of the remainder of the industry rather more difficult to assess.

At one time it was thought that three large aircraft groups and two engine companies would emerge. In this latest development, the powerplant position, at least, would appear to have been solved. But on the airframe side it seems that the Hawker Siddeley/de Havilland merger is likely to lead to a two-group arrangement for the industry—a configuration which many people consider to be far from ideal.

However, be that as it may, one thing is abundantly clear. Formation of the larger groups may well be necessary in order to gather technical and financial strength to meet the challenge of the increasingly difficult business of producing aeroplanes and aero-engines for the World's markets. But they will fail in their purpose if in their constitution there is any reduction, among their various sections, of the initiative and freedom of thought that is the life-blood of any technical team. Whatever else happens, these individual components of the big combines must be allowed to retain a good measure of their individuality and all their team spirit—for these are characteristics that have taken many years to acquire and, once lost, cannot be regained.

Looking Towards Space

In the half-light of the Advisory Council on Scientific Policy's recent statement regarding Britain's place in space research—about which we wrote last week—it was good, a few days later, to learn of a somewhat brighter and more encouraging outlook on the part of our technological educationalists. The course on space technology to be instituted by the College of Aeronautics at Cranfield is a most welcome innovation. It was high time that plans were laid to meet the educational needs of future space technologists on this side of the Atlantic; and what better place is there for this project than an aeronautical post-graduate college with the necessary facilities already in being?

Cranfield's present guided missiles course has shown how successfully this sort of thing can be organized on an international scale. It will be remembered that this grew out of a NATO course fostered by AGARD and, doubtless, these new proposals have been inspired by the same source. And it is worth recalling, too, that it was at Cranfield that the Russian delegate to a space symposium two years ago gave the first hint of the Soviet Union's launching of a satellite.

Institutions such as the College of Aeronautics can also play an important part in research—for their facilities and staffs are, by their very nature, well qualified for such tasks. It is to be hoped that Cranfield will come eventually to play an even bigger part in Britain's space research activities than that represented by the vital academic task of disseminating knowledge.

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A MERRY CHRISTMAS *to All Our Readers*

Matters of Moment

The New Grouping

FOLLOWING so soon after the Hawker Siddeley Group's recent bid for the Blackburn Group, their proposed take-over of de Havilland Holdings last week came as a considerable surprise to most people and made headline news. This incorporation of the large organization that is centred on Hatfield into Hawker Siddeley's already extensive aeronautical interests is the first really large step so far taken towards the current regrouping of the industry into a small number of large and powerful units.

Acceptance of the offer has been recommended by the de Havilland board. And should this merger come about it will result in the formation of a group that was described in a joint statement issued by the two boards as "the most powerful organization of its type in the British Commonwealth."

In financial terms, the proposed merger is based on an offer by Hawker Siddeley for the share capital of de Havillands. Ordinary shareholders are offered a straight exchange of their £1 shares for Hawker Siddeley Ordinary £1 shares; while the holders of D.H. 5¼% Preference shares will get Hawker Siddeley 5½% Preference shares in the ratio of three Hawker Siddeley units and £1 cash for every four de Havilland units held.

Point was made in the joint statement announcing these negotiations that integration of the two companies would be of great advantage to both, because of the pre-eminence of de Havillands in the field of civil aviation and the vast experience of the Hawker Siddeley Group in military matters. It referred, too, to the interests of both groups in Commonwealth countries and to their extensive commitments in the guided weapons field.

By this new move, Hawker Siddeley, in addition to gaining a whole range of products to complement those it already has, will take into its fold a fine and enterprising design and development team and a healthy production organization. No details have yet been made available of how Hawker Siddeley proposes to integrate these units with the others forming their group. Nevertheless, it seems clear that a powerful integrated sales organization, of the kind that is likely to be formed with such a comprehensive range of products to offer the World's markets, should be a potent force in helping to maintain the level of Britain's aeronautical exports and in consequence the prosperity of the industry at large.

Prince Philip Flies the Hovercraft

FOLLOWING his recent flight in the blind-landing Canberra at Bedford, the Duke of Edinburgh widened his test-flying experience last week when he flew the SR-N1 Hovercraft during a visit to Saunders-Roe at Cowes. He arrived, in stormy weather conditions, flying a Whirlwind helicopter, and sat next to Lt. Cdr. Peter Lamb, the company's chief test pilot, during a demonstration of a Hovercraft transition from land to sea, via the Cowes slipway.

At sea, the Duke changed places, and flew the Hovercraft, which is not fitted with dual control, on a very rapid down-wind run. The wind speed was about 25 knots, but Prince Philip, who had previously studied the SR-N1 handling notes found no difficulty in handling the craft. He turned it back into wind, and "drove" it back to Osborne Bay, where he disembarked.

During his brief visit, the Duke also examined Black Knight, the Skeeter, and the Saro P.531, which is now to be called the Wasp in Royal Naval service.

Space Technology at Cranfield

VERY appropriately, it was during the annual guided missiles course dinner at Cranfield that the first public mention was made of plans by the College of Aeronautics to add a one-year course on space technology to its syllabus. This, we understand, is to start in October, 1961; at present the planning of the course programme is in a preliminary stage.

Guests and members of the fourth guided missile course heard this news during the after-dinner speeches. As usual this was a greatly enjoyable function and it was abundantly clear that these international courses are proving a great success. The present one has 26 members from nine countries. The largest contingent is from Holland with six members; Sweden comes next with five; then Germany with four; India and Norway with three; Yugoslavia with two; and Belgium, Denmark and Italy with one student each.

Everyone was sorry to hear from the Principal that Sir Frederick Handley Page, chairman of the Board of Governors, was unable to be present because of an indisposition. It was good to learn, however, that no fewer than 24 members of previous guided missiles courses were present at the dinner.

ARGENTINIAN OCCASION.—The Argentine Air Attaché, Air Cdre. A. R. Sola Claret, and Mme. Sola Claret, with His Excellency the Argentine Ambassador, Rear Admiral Teodoro E. Hartung, at a reception in the Embassy in London on December 15.

The toast to the guests was proposed by Prof. W. S. Hemp, who paid a tribute to the industry for the support it had given to the courses right from their inception. Air Vice-Marshal G. Silyn Roberts, C.B., C.B.E., A.F.C., responded on behalf of the guests and gave some amusing reminiscences of an early form of guided "missile"—the Queen Bee pilotless target aircraft—in which he did a good deal of flying.

One of the students, Sqn. Ldr. C. S. Seshadri, proposed the toast to the College and spoke of the value of the course not only from the technical viewpoint but by reason of the opportunity for students from a number of countries to gain mutual understanding and insight into each other's problems. The reply was made by Prof. A. G. Smith who entertainingly surveyed the College's activities during the year; referred to its diversified interests and the new short non-aeronautical course; and disclosed its coming association with space technology.

It is too early, as yet, for details to be available, but one would expect that most of the departments of the College would be involved. In the aerodynamic field, for example, subjects for the course would no doubt include hypersonics and re-entry problems; propulsion would presumably include rocket dynamics and chemical and non-chemical powerplants. Celestial mechanics; special materials for high- and low-temperature applications; radio astronomy; structural design for minimum weight and high-g requirements; thermal effects; and the physiological and psychological effects of space travel, are all subjects that are likely to be included. A place in the syllabus will doubtless be found, too, for such specialist non-aeronautical subjects as the upper atmosphere and ionosphere, plasma physics and magnetogasdynamics.

New U.S. Records

A NEW World height record of 103,395.5 ft. was claimed by the U.S.A.F. on December 15. Set up by Capt. J. B. Jordan in a Lockheed F-104C Starfighter over the Mojave Desert 100 miles north of Los Angeles, this new altitude figure beats the U.S. Navy's 98,650 ft. logged by a McDonnell F4H Phantom II on December 6 and the previous Russian record of 94,658 ft. established on July 14 by a T431.

Confirmed by the U.S. National Aeronautics Association, the new U.S.A.F. record is subject to recognition by the Fédération Aéronautique Internationale before it officially replaces the Russian World altitude record set up by Vladimir Ilyushin in July. Capt. Jordan is reported to have said at a news conference that his flight was above the recordable height of the F-104C's altimeter and radar height finders could not track him. Theodolite cameras on the ground were used to measure the exact altitude of his aircraft.

Indicative of the determined U.S. effort to wrest from the equally ambitious Russians all their recently established records was the American claim, on the day after the height attempt, for the absolute speed record. This was established by a U.S.A.F. Convair F-106 Delta Dart, which flew at 1,520.9 m.p.h., or 37.9 m.p.h. above the Soviet E-66 performance. This achievement by a standard Service fighter type seems to indicate that for Mach 2 aircraft, speed records are largely a matter of fuel capacity, which determines for how long they can go on accelerating.

The third record claimed by the Americans is for height by helicopters of up to 3,000 kg. gross weight, following the achievement of 30,100 ft. by a Kaman H-43B on December 16. The previous record of 21,982 ft. was held by a Russian Mi-1 helicopter.

Another British Missile Export

FROM Short Brothers and Harland comes news of an order from the Swedish Admiralty for Seacat surface-to-air guided missiles for evaluation. No quantity has been mentioned, but presumably at this stage the number involved for the purpose of evaluation is not likely to be very large.

Nevertheless, this is a most encouraging contract and if all goes well, Seacat will become the second British guided missile to be adopted by Sweden. As a close-range anti-aircraft defence weapon it would complement the high-altitude Bristol/Ferranti Bloodhounds already chosen as the main weapon for the Swedish anti-aircraft defence system.

Seacat is at present under development at Belfast for the Royal Navy. It is powered by a solid-propellent rocket and is derived from the Short SXA5 test vehicle that was first shown publicly at the S.B.A.C. display in 1957; it has been said to be controlled through a command guidance system. This year, four Seacats were displayed at Farnborough on a quadruple launcher, but no performance details were available. The development contract for the missile was signed last year and it has been officially stated that by the early 1960s a considerable number of R.N. ships would be equipped with anti-aircraft missiles of this type.

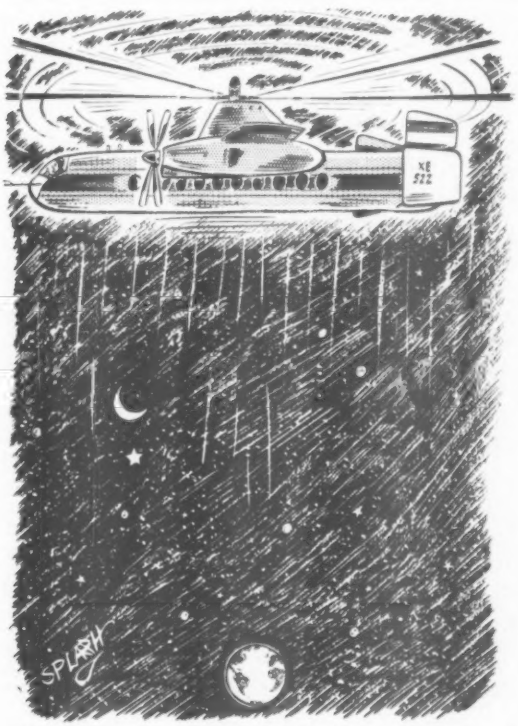
NATO Air Defence

DURING the first stages of the NATO Council meeting in Paris last week, Gen. Norstad, Supreme Commander, Europe, made two main points. One was that the integration of European air defence was absolutely vital and the other that progress in nuclear stockpiling was not as bad as it had been made out. He also supported the idea that NATO itself should become a fourth nuclear power, but this did not receive any great response.

In his plea for integrated air defence, which is supported by all countries except France, Gen. Norstad said that he must have a unified air defence system to get on with his plans. The United States is also interested in the stockpiling of atomic weapons throughout NATO, but France will only agree to this under national command.

Although the French have resisted any unified air defence, it seems likely that they are now willing to agree to technical discussions within NATO on the standardization of ground-handling equipment, communications, radar and so on, without committing themselves on the command aspect. It is expected that within the next few months the allies will have meetings to discuss air defence and such subjects as co-operation in the production of weapons. These discussions should help in the eventual agreement on a unified air defence command.

Mr. Watkinson, Minister of Defence, told the NATO council that the 2nd Tactical Air Force would remain in Germany beyond 1961. In the light of the present air defence situation in NATO and of the state of progress of West Germany's build-up of its Air Force, the United Kingdom was prepared to re-examine the future plans of her fighter squadrons in Germany. She is entitled to withdraw the 2nd T.A.F. squadrons from Germany by the end of 1961.



"Well, the vertical take-off seems O.K., now tell me how I fly horizontally."

SNOW SCENE.—Lit by the rays of a winter sun, snow-covered Alpine peaks make a picture appropriate to the Christmas season. They were seen from a B.E.A. Comet 4B on one of its recent European proving flights.

Retiring From "Jane's"

AFTER 40 years' association with *Jane's All The World's Aircraft*, and 19 years as editor, Leonard Bridgman has retired, at his own wish. He is succeeded by John W. R. Taylor, who has been assistant compiler of the four most recent volumes of the work. As we recorded last week, the 1959-60 "Jane's," published on December 16, is the Golden Jubilee Edition.

Speaking at a cocktail party in London last week to mark the publication of this edition, Mr. Peter Masefield paid tribute to Leonard Bridgman. His contribution to the accurate recording of aviation history would, said Mr. Masefield, live on when many other things had been forgotten. It was in 1919 that Bridgman first became associated with "the Encyclopædia Britannica of aircraft" of which the late C. G. Grey was then editor.

His paintings of aircraft with their attention to accuracy and their realism were, remarked Mr. Masefield, among the finest of their kind. He cited the illustrations for Oliver Stewart's "The Clouds Remember" as being one of Leonard Bridgman's greatest works.

Although he will no longer be concerned with the monumental task of editing "Jane's," Leonard Bridgman will retain a link with the work as a member of the board of Jane's All The World's Aircraft Publishing Company, Ltd.

John Taylor is well known as an aviation author, and frequently contributes to the pages of THE AEROPLANE AND ASTRONAUTICS. Before setting up as a free-lance writer, he served in the design office of Hawker Aircraft and on the publicity staff of Fairey Aviation. He is consultant editor of *Air BP* and editor of the range of Ian Allan aircraft books.

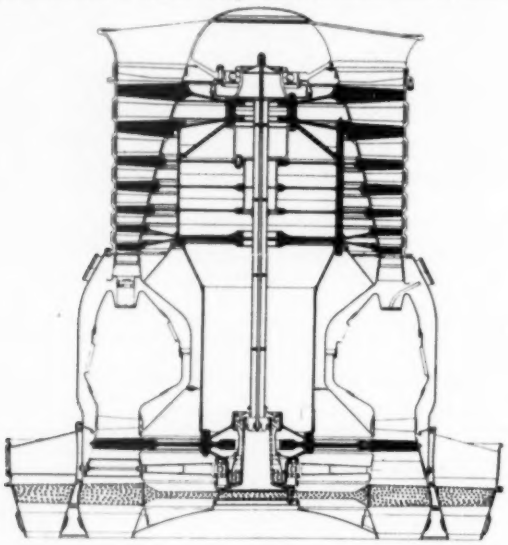
Bristol Siddeley's Latest Engines

MUCH new information about current Bristol Siddeley projects was given on December 16 by Dr. S. G. Hooker, the company's technical director (aero) in the James Clayton lecture which he read before the Institution of Mechanical Engineers. In particular, he referred to military and civil applications for the company's range of ducted-fan engines, to developments of the Olympus and to turbo-ramjet powerplants for supersonic transports.

Dr. Hooker predicted that development of ducted-fan engines would form the main effort of most aero-engine companies in the 1960s. Tracing the development of these engines, he mentioned the Rolls-Royce Conway in which the by-passing of air from the low-pressure compressor had given improved propulsive efficiency and an s.f.c. below 0.7 lb./lb./hr.

The Bristol Siddeley BE.58, a later design, he said, by-passed three times as great a proportion of air as the Conway and would give an s.f.c. of less than 0.6 lb./lb./hr. By raising the compression ratio a consumption of less than 0.5 lb./lb./hr. could be foreseen. Such an engine was the real ducted-fan engine. Afterburning in the fan stream would give a large thrust increase and as a result such engines would be used at both subsonic and supersonic speeds.

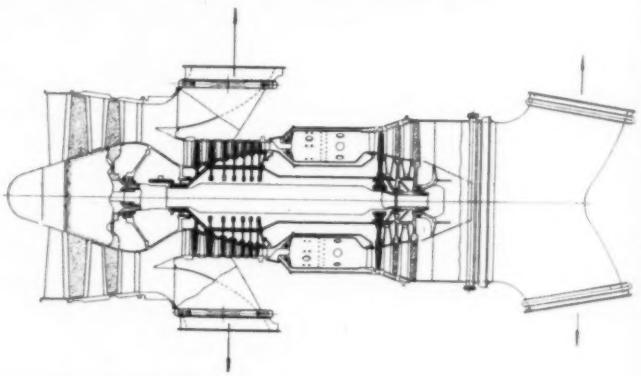
The thrust/weight ratio of turbojet engines had increased from less than 2 in the early 1940s to more than 4 with the Avon, Viper, Olympus and Conway and more than 6 with the Orpheus. For military purposes aircraft with VTOL or STOL performance were desirable; this problem was receiving great attention at present and a suitable powerplant would be the Bristol Siddeley BE.53 ducted-fan lift/thrust engine; its thrust/weight ratio is 7 : 1. Although not mentioned by Dr. Hooker in his lecture, this engine has been chosen for the Hawker P.1127 VTOL fighter and strike aircraft.



LIFT ENGINE.—Thrust/weight ratios of 14 : 1 will be achieved with aft-fan VTOL lift engines of this type.

Discussing application of a BE.53-type engine to a single-seat aircraft, Dr. Hooker said that it would be of single-engine configuration with the engine both lifting the aircraft at take-off and landing and propelling it in normal flight. The jet would be deflected either downward to give vertical lift or inclined at any angle up to the horizontal to give a combination of lift and thrust.

Airflow from the ducted fan at the front was bifurcated into ducts on each side of the engine, as was the exhaust jet; the ducts ended in directional control nozzles. Such an aircraft could have either VTOL or STOL performance as required; the jets could be turned downwards rapidly to reduce the time in which ground erosion and scattering of debris would occur.



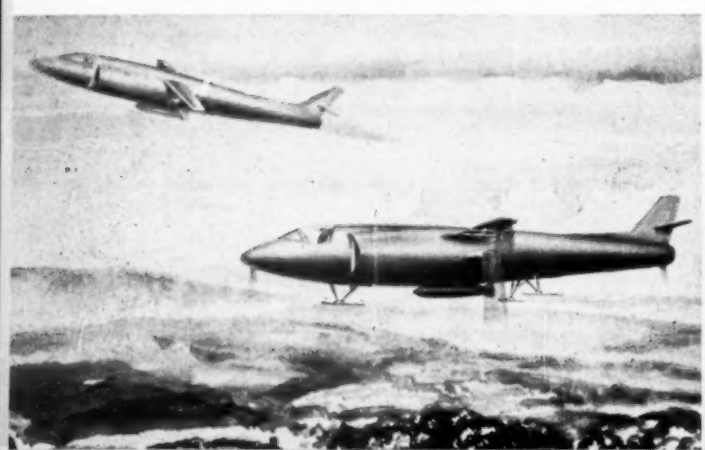
A NEW POWERPLANT.—This lift/thrust engine, presumably the BE.53, has four jet effluxes which can be swivelled to give lift and/or thrust. The BE.53 powers the Hawker P.1127 VTOL strike aircraft.

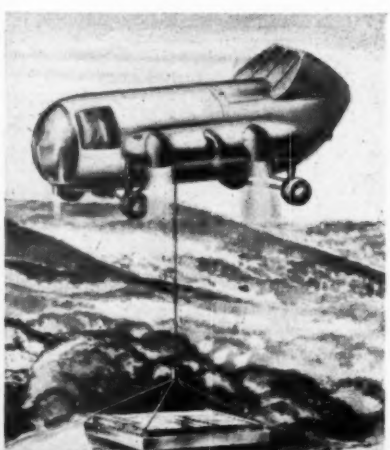
For VTOL transport aircraft, specialized low-weight lift engines were necessary in addition to lift/thrust engines. For engines used only during take-off and landing thrust/weight ratios of about 14 : 1 could be achieved. Bristol Siddeley was actively interested in such engines of the low-compression ratio ducted-fan type.

Lift/thrust engines made possible the design of simple jet-sustained vehicles without wings which could travel twice as fast as the largest current helicopters and would have a lifting capacity almost as great.

Another possibility was a VTOL aircraft with wings just large enough to support it at maximum speed. Below top speed jet deflection would add to wing lift. Such a low-weight, low-drag aircraft would have a 60% greater range than a conventional aircraft of the same take-off weight.

A developed Bristol Siddeley Olympus has been chosen to power the supersonic TSR-2 tactical support and reconnaissance aircraft being produced by Vickers and English Electric. In view of this, Dr. Hooker's remarks about the Olympus were interesting. He said that at 36,000 ft. an engine of this size without reheat would develop 9,000 t.h.p. at Mach 1 and 29,000 t.h.p. at Mach 2, with s.f.c. of 0.55 and 0.45 lb./t.h.p./hr. respectively, representing an overall thermal efficiency of about 30%. With reheat the same engine would develop 100,000 t.h.p. at Mach 2.2 with an s.f.c. of 0.625 lb./t.h.p./hr.





POSSIBILITIES.—The VTOL strike aircraft (extreme left)—possibly similar in concept to the Hawker P.1127—has a single lift/thrust engine. The wingless craft (left), also with a single lift/thrust engine, could travel twice as fast as current helicopters and lift almost as much.

General Aviation News

SPACE FUNDS.—The U.S. Congress is being asked to approve an expenditure of nearly £286 million for space research and development in the coming financial year.

ROCKET-RAMJET.—An engine integrating ramjet and rocket systems has been tested by the Marquardt Corporation at simulated flight speeds of more than Mach 5.0 at simulated altitudes exceeding 100,000 ft.

GERMAN MISSILES.—Expenditure of 480 m. marks (about £40 m.) has been approved by the Bundestag defence committee for the purchase of missiles which can carry nuclear warheads. It is believed that Mace SSMs will be bought from the U.S.

ARMY BEAVERS.—Negotiations are to be opened with D.H. Canada for the purchase of Beavers for the Army. It has been decided that Army needs will be met by the Beaver in preference to other types. More Twin Pioneers are to be ordered from Scottish Aviation, who had designed the single-engined Pegasus to meet Army requirements.

F8U-2N CRUSADER ORDER.—The U.S. Navy has placed a $58 million order with Chance Vought for F8U-2N all-weather fighters. A development of the F8U-2 Crusader II, the F8U-2N is powered by a Pratt & Whitney J57-P-20 turbojet and has improved radar and instrumentation. It is expected to enter U.S. Navy service during next year.

RB.141 RUNS.—First run of the Rolls-Royce RB.141 by-pass engine was made recently at Derby. Its take-off thrust is now given as 15,000 lb. RB.141s will be available for airline service early in 1962.

LONG DROP.—Capt. Joseph Kittinger made a successful parachute descent "from the fringes of space" on December 12 when he jumped from a balloon just over 14 miles above the New Mexico desert. He fell for more than 10 miles before his parachute opened. On November 16, he established a World record by jumping from 14½ miles up and falling free for 12½ miles. Jumps are being made as part of tests to prove emergency escape techniques for future space-pilots.

TOP WEIGHT.—A Boeing B-52G has been flown from McConnell A.F.B. at a take-off weight of 488,000 lb. Thought to be a record, this figure is approximately 40,000 lb. above the current Strategic Air Command B-52G gross weight limit.

K.L.M. ELECTRA SERVICE.—The Lockheed L-188C Electra went into service with K.L.M. on December 15 between Amsterdam and Cairo (see our issue for December 11).

MOUNTSORREL PRODUCTION.—The Rolls-Royce factory at Mountsorrel, Leicestershire, which was almost completely destroyed by fire seven months ago, has now been entirely rebuilt. Starting production again in January, the factory manufactures powerplant sheet-metal assemblies.

MORE U.K. JINDIVIKS.—According to Australia's Minister of Supply, at least 40 more Jindivik pilotless target aircraft are to be ordered by the U.K. to supplement the 50 already on order. The high-altitude Jindivik 3 is now under development and will be tested soon.

NOISE TALK.—A panel of experts on aircraft noise abatement set up under the auspices of O.E.E.C. held its first meeting on December 10 and 11. The U.K. was represented by Dr. G. E. Bell (M.o.A.), Mr. D. W. Robinson (N.P.L.), Mr. H. J. Purkis (Building Research Station), Mr. N. Fleming and an observer from the B.S.I. Other countries taking part were Denmark, France, Germany, Holland, Sweden, Switzerland and the U.S.

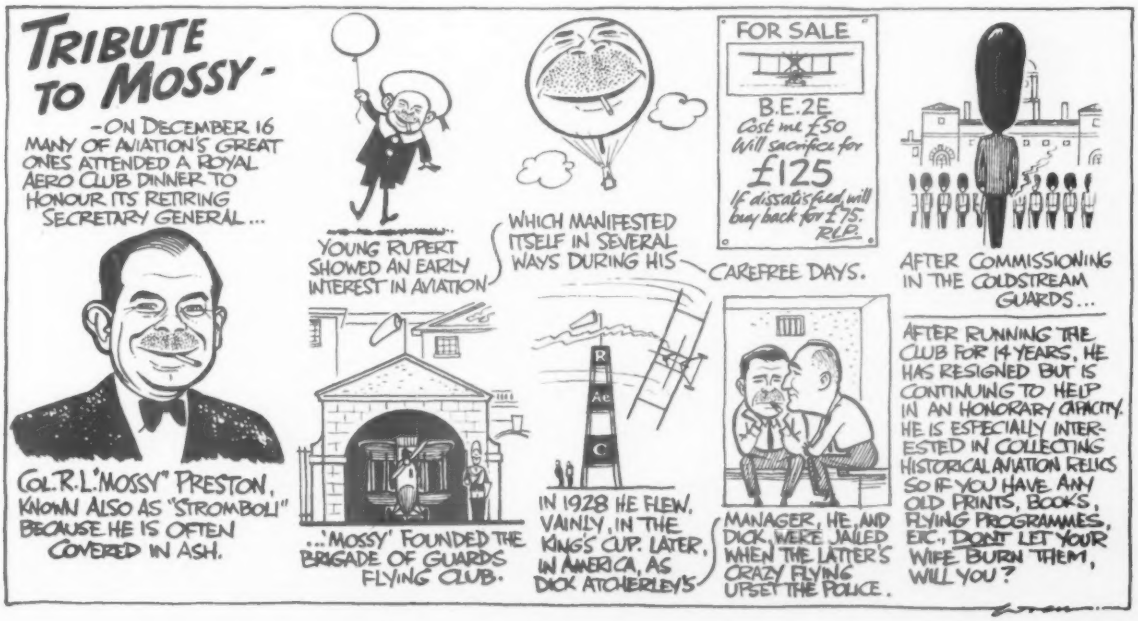
ARLANDA OPEN.—The 11,000-ft. main runway at Stockholm's new international airport, Arlanda, was formally opened on December 14 with the arrival of an S.A.S. Caravelle carrying the Swedish Minister of Transport, S.A.S. president and other guests. Among the facilities at Arlanda is Decca D.A.S.R. 1 air surveillance 10-cm. radar, with a range of more than 100 miles at heights above 40,000 ft. The installation at Arlanda, with two reflectors mounted back-to-back on a 90-ft. tower, is the first of its type.

ACCIDENT INVESTIGATION.—The committee which is to review civil aircraft accident investigation procedure, and the conditions under which the licences of flight crew or maintenance engineers may be cancelled or suspended, comprises Sir David Cairns, Q.C. (chairman), Sir Frederick Tymms, W. L. Heywood, Peter Masefield and H. C. I. Rogers. Written evidence or memoranda on the subject can be submitted to E. J. Martin, M.o.A., Room 3000C, Berkeley Square House, London, W.1.

BLACKBUSHE DOOMED?—The Blackbushe Airport Tenants Association, representing 12 users at the airport, is reported to have abandoned its efforts to purchase the airport, which the M.o.A. proposes to close next year.

KUWAIT HELICOPTERS.—Westland Aircraft, Ltd., has received a follow-up order for three Whirlwinds from the Kuwait President of Civil Aviation. Bringing the total to four, these machines will join the original Whirlwind delivered to Kuwait last October.

G.E. CF700-1.—First production versions of the General Electric CF700-1 turbofan should be available by mid-1961. This 4,000-lb. thrust civil engine is an aft-fan version of the J85 turbojet. Its s.f.c. is 0.69 lb./lb./hr. at take-off; weight, 585 lb.; diameter, 33 in.; length, 69 in.


TRIBUTE TO MOSSY -
-ON DECEMBER 16 MANY OF AVIATION'S GREAT ONES ATTENDED A ROYAL AERO CLUB DINNER TO HONOUR ITS RETIRING SECRETARY GENERAL...
COL. R.L. 'MOSSY' PRESTON, KNOWN ALSO AS "STROMBOLI" BECAUSE HE IS OFTEN COVERED IN ASH.
YOUNG RUPERT SHOWED AN EARLY INTEREST IN AVIATION
...'MOSSY' FOUNDED THE BRIGADE OF GUARDS FLYING CLUB.
WHICH MANIFESTED ITSELF IN SEVERAL WAYS DURING HIS CAREFREE DAYS.
IN 1928 HE FLEW, VAINLY, IN THE KING'S CUP. LATER, IN AMERICA, AS DICK ATCHERLEY'S MANAGER, HE AND DICK, WERE JAILED WHEN THE LATTER'S CRAZY FLYING UPSET THE POLICE.
FOR SALE
B.E.2E
Cost me £50
Will sacrifice for
£125
If dissatisfied will buy back for £75.
R.L.P.
AFTER COMMISSIONING IN THE COLDSTREAM GUARDS...
AFTER RUNNING THE CLUB FOR 14 YEARS, HE HAS RESIGNED BUT IS CONTINUING TO HELP IN AN HONORARY CAPACITY. HE IS ESPECIALLY INTERESTED IN COLLECTING HISTORICAL AVIATION RELICS SO IF YOU HAVE ANY OLD PRINTS, BOOKS, FLYING PROGRAMMES, ETC., DON'T LET YOUR WIFE BURN THEM, WILL YOU?

Air Transport

Fares Down, Hopes Up

THE introduction of economy-class fares by B.O.A.C. on its cabotage routes is the latest in a series of fare reductions by the two British airline Corporations, which have been forcing the pace both within and outside IATA. It is now a matter of history that the failure of the IATA Traffic Conferences at Honolulu in September was largely due to B.O.A.C.'s insistence ("very proper," in Mr. Sandys' phrase) on the introduction of economy fares. Agreement was reached, at that conference, only on fares in Europe, between Europe and South America and between North and South America.

Giving news of the Government's decision during his first major contribution as Minister of Aviation to a debate in the House last week, Mr. Sandys said that the economy-class fares, on routes to the West Indies, Africa and the Far East, will be 10% to 20% below existing tourist fares. He went on:—

"I am consulting the colonial authorities and other airlines concerned about the exact level of fares to be charged on each of these routes and on the timing of their introduction. Before reaching this decision, I discussed the matter with the independent airlines principally interested, namely those operating on routes to East and Central Africa; and I am taking steps to ensure that the reduction in B.O.A.C.'s fares shall not unfairly affect the Colonial Coach routes which these independent companies have so successfully opened up."

The Minister's statement clearly poses two immediate questions to which the answers are, at the moment, far from clear. First, how is B.O.A.C.'s position *vis-à-vis* IATA likely to be affected by the introduction of economy fares and, secondly, how is Mr. Sandys to keep his promise that he will protect the Colonial Coach services to East and Central Africa? An IATA statement has made quite clear that another session of the Traffic Conferences can only be called, before the threatened open-rate situation begins on April 1, if it is demanded by two-thirds of IATA members or by a decision of the Director General. A prerequisite of such an additional meeting would be evidence that the carriers concerned in the major points at issue had changed ground sufficiently for effective agreement to be possible.

Now that B.O.A.C. (and for that matter, South African Airways) has shown clearly that it will "go it alone" with economy fares wherever possible, other carriers may prefer to comply rather than to compete. B.O.A.C. may also become a little more conciliatory over the North Atlantic route, where —for its own sound reasons—it has been standing out for retention of a three-tier fare structure (or more, specifically, retention of the middle-class, tourist, fare). The climate therefore seems at least to be becoming a little more favourable for another IATA meeting in the early part of the New Year. If no agreement is reached by April, incidentally, fares will be decided by Governments, and not by the airlines themselves, since Government approval is still required for any fare changes, whether IATA-sponsored or not.

The independent companies are hardly likely to greet the news of B.O.A.C.'s economy-class plans with enthusiasm—despite Mr. Sandys' promise to do all he reasonably can to encourage the further development of this "most useful element in the pattern of British independents" and his tribute to their initiative in pioneering new routes and developing cheap-fare services. The reduction in B.O.A.C. fares is bound to affect the Colonial Coach services; how is Mr. Sandys to prevent it doing so "unfairly"? In June, 1957, the then Minister of Transport and Civil Aviation said the Government had accepted the A.T.A.C. recommendation that, when T34 (economy) fares were eventually introduced on the African routes, B.O.A.C. should provide 70% of the capacity required for this class of service, and the two independents, Airwork and Hunting Clan, should provide 30%. It remains to be seen whether this arrangement is all Mr. Sandys had in mind, or whether some other protection is to be offered to the independents. In any case, these are matters which the new licensing authority will be asked to control; that authority is still no more than a Ministerial promise.

Meanwhile, B.E.A. is going quietly ahead with its own cheap-fare plans. As already recorded, the first step in this direction was the series of airline-to-airline agreements negotiated at Honolulu covering an average 17% cut on more than 400 return fares on specific services to points in Austria, France, Germany, Greece, Italy, Portugal and Spain. A direct agreement with Aeroflot will bring the tourist return fare to Moscow down to £85 next summer, and other routes, not subject to IATA control, on which cuts are to be made are those to Malta and Gibraltar, with savings of up to 25%. Internal routes also will benefit, with a 7% reduction on most fares to the Channel Islands and, as announced last week, savings of up to 30% on domestic night flights to Belfast, Edinburgh, Glasgow and Manchester.

The Air-freight Business

THINGS are certainly moving in the effort to find means of reducing profitable cargo rates and, amongst operators, of providing capacity for the continued upswing, even at existing rates, of the ton-mile curve. Canadair and Flying Tiger have got together on a joint sales research programme and airlines continue to announce the conversion of regrettably out-moded piston-engined equipment to all-freight rôles.

About $200,000 (say £72,000) is to be spent in 1960 by the operator/manufacturer researchers, who have retained two specialists in freight-traffic development as consultants. One of these, Prof. Stanley H. Brewer, was responsible for the massive investigations completed for Boeing during the past couple of years. These and other studies have suggested that an average freight rate of 13-14 cents per ton-mile will create a market with some seven to 10 times the present volume.

In the first phase of this research programme, now completed, the characteristics of cargo now being hauled by Flying Tiger have been analysed in detail; in the second phase the characteristics of commodities which are "air potential" will be "identified, located, measured and determined."

The all-cargo aircraft conversion business can be considered as being an attempt to find a profitable use for more or less unsaleable aircraft as well as being a quick means of getting in on the freighting act. United Airlines is (like American Airlines) converting its DC-7s and the first six are now being prepared for all-cargo operations starting next March. During 1960 United's all-cargo capacity will be increased by 93%, with a trebling of its present freight ton-mileage (68 million in 1958) during the next five years.

Air India International is converting two of its nine L-1049s to the all-freight rôle—and claims to be the first operator to make such modifications to the Super Constellation. Lockheed Aircraft Service is doing the job and the new-look 1049s will be put on the Bombay-London run next year.

Meanwhile the air-freight business is cluttered up not only with a lunatic profusion of different commodity and route rates, but also with time-wasting clearance formalities and associated paper work. During the first three weeks of this month ICAO held one of its "facilitation" meetings in Rome and the air-cargo clearance problems were among those which were discussed.

ONE FOR THE POOL—First of Air India International's three Conway-engined Boeing 707-420s was rolled out of the Boeing works early this month. It is the 94th 707 from the Renton production line. Air India recently signed a pooling agreement with B.O.A.C. and Qantas covering services on the Eastern and Atlantic routes.

K.L.M. Prepares for the DC-8

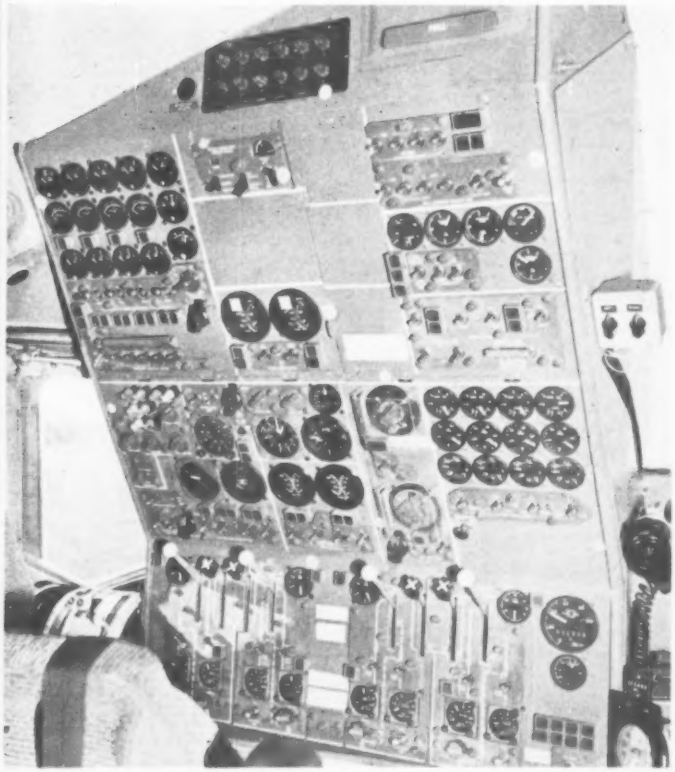
SOMETHING of the magnitude of the overall effort involved in the introduction by an airline of new equipment can be appreciated when just a part of this preparation—flight-crew training—is examined. K.L.M. is due to start DC-8 services on April 1 next year and is already operating the first of its Electra services. Altogether about 300 pilots and well over 100 flight engineers will need to be trained or converted for duties on these two aircraft, even though the fleets (12 of each) are relatively small by some airline standards.

For the DC-8 fleet about 230 pilots and 80 flight engineers will have been passed out before the end of 1961. This programme will be a very expensive one by pre-turbojet standards—and even more so by those of an earlier air transport era. Some of us can remember how eyebrows were raised in pre-War days when British Airways set a minimum of 15 hours of active flight-deck experience for pilots of the Lockheed 14, or Super Electra, which was a fairly advanced and complicated aeroplane by the standards of those days. With modern turbojet aircraft the required hourage, apart from route experience, might be seven times that figure and the cost, in aircraft hours alone, multiplied by 30 or so.

Fortunately, very sophisticated flight-deck simulators have been developed and a high proportion of the essential hours of cockpit familiarization, trouble-shooting, and navigational and approach procedures can be completed with almost equal effectiveness while using these devices and at a cost per hour which, though high, is only about a fifth of that of the equivalent aeroplane. The present-day synthetic trainer can simulate everything from nose-wheel rumble on take-off to the visual impressions on final approach, and the jet-engine-operation trainer, with pilots' and flight engineer's stations, can simulate the full effects of any event in day-to-day powerplant running.

Some idea of the effect of simulator techniques on present-day flight-training programmes can be gained from the fact that the DC-8 pilots' course includes six weeks of systems engineering and other classroom training, about 10 days of simulator work and eight flying days (involving perhaps 16 actual days in the winter) for base training in the air. After that the pilot may put in an initial 20 hours on route training and familiarization in service. To start the ball rolling, two instructors from Douglas will be based at Schiphol during the initial training period after delivery by a K.L.M. crew of the first aircraft in February.

Schiphol's new 11,000-ft. runway, 06/24, is due to be completed in time for the introduction of K.L.M.'s DC-8 services in April. This runway is the second in a series of four which will eventually be tangential to the new terminal centre on the north side of the present airport.



The flight engineer's panel in the DC-8 with the "diagrammatic" fuel control and instrument system at its base. This panel and its controls are duplicated in the DC-8 and jet-engine simulators in K.L.M.'s training centre.

The K.L.M. training unit is very completely equipped with simulators of different types. There are three of the familiar Link trainers, four full-scale flight-deck simulators, including that for the DC-8, and a jet-engine simulator. An Electra trainer is due to be delivered this month.

The three Links have Convair characteristics and instrument layouts—including the Zero Reader—and provide general instrument-flying, radio-navigation and procedure and approach training for new pilots joining K.L.M. from the Government civil flying school. Of the four flight-deck simulators two are from Redifon; one of these is a Viscount type trainer which is used mainly for engine-handling experience, and the other is a two-seat route, radio and general traffic procedure trainer for pilots who have passed through the basic Link courses. The third is a DC-7C simulator; this has been giving a utilization average of 16 hours per day with only a 3% unserviceability rate. A 24-hour conversion course on it is considered to be equivalent to 15 hours in the air and pilots need only eight hours of succeeding air experience.

The DC-8 simulator is now being "warmed-up" for full-scale use and has been used so far for cockpit familiarization and general systems training. The equipment does not include means for simulating physical movement of the aircraft, or, at present, the closed-circuit television system for visual take-off and approach simulation—though this may be added later. The aural effects, however, provide more than adequate realism. The value and the complication of these modern simulators may be gauged from two simple and unrelated facts: signals

Air Transport . . . .

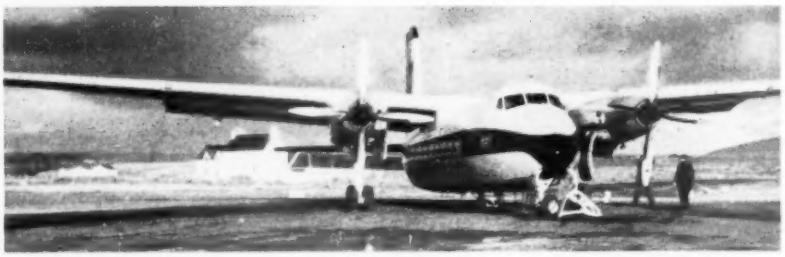
from six transmitters can be pre-selected and co-ordinated to match the radio-aid characteristics of any chosen area in a route network; and the simulator equipment used by K.L.M. involves the attention of 30 technicians working in shifts.

An examination of this simulator provided a reminder of some of the features of the DC-8—such as the windshield air-blast rain-remover (in lieu of wipers); the electric and hydraulic operation of the variable-incidence tailplane; the inner-aileron and rudder boosters; and the rudder-pedal interconnection for the steerable nosewheel. K.L.M.'s DC-8 has a true airspeed indicator which operates from 200 knots upwards, a Kollsman flight data system and a Sperry Integrated Instrument System.

The flight engineer's primary responsibility is for the fuel situation, but he also looks after the air-conditioning and pressurization, the anti-icing systems and emergency equipment. There are 10 fuel tanks, each with its gauge and a totalizer at the engineer's position. All engine instruments are in the pilot's central panel. The minimum K.L.M. DC-8 flight crew complement is still being considered, but it will include a flight engineer.

The jet-engine simulator room in the training section is arranged so that preliminary lectures for 10 or so pilots and engineers can be given on the main demonstration unit. This unit consists of a cut-away working scale model of the JT-4 in which all sequences, normal and emergency, are demonstrated by means of coloured lighting; above the model are 10 large-size instruments on which all the essential and appropriate readings, including airspeed, altitude and outside air temperature, are given. Everything from an abortive start to an ice-accretion flame-out can be demonstrated. To one side of what might be described as the lecture area are pilots' and flight engineer's panel and control simulators on which individual or flight-crew team practice can be obtained in all aspects of powerplant and powerplant systems handling.

Herald to the Islands



IF you look at 25-year-old flying maps of Scotland you will find on them nearly all the aerodromes which are at present used by B.E.A. for its so-called social services in the Highlands and Islands. Not all of the present aerodromes are on quite the same sites, but they are near enough to their original positions—a fact which emphasizes the unchanging needs both of fixed wing aeroplanes and of population-movement.

In the 1930s Midland and Scottish Air Ferries (Scottish Motor Traction), Highland Airways, Aberdeen Airways, Allied Airways and Scottish Airways at one time or another served the various communities, and one or two of them—in the easier days when an airport manager could also be the traffic controller, groundsman and coach driver—may have done a little better than break even.

Whether they made money or not, these airlines laid the foundations for a series of essential services which are still being operated and which will continue to be operated. The Shetlands, Orkneys and Hebrides are distant by days of surface travel from the main centres in Great Britain and even the nearer Islay and Kintyre are cut off by sea or a long peninsula from Glasgow, which is less than an hour's air journey from them.

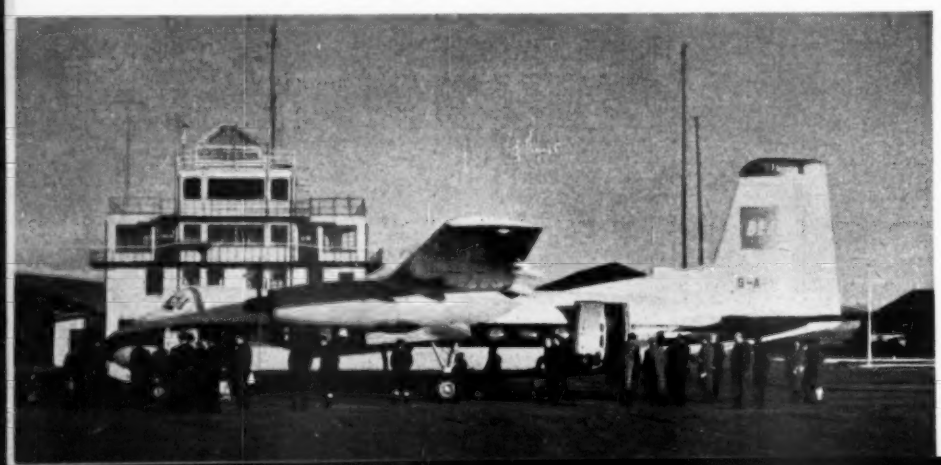
B.E.A. is to use three Dart Heralds on its principal Scottish social services and last week the first production Herald, G-APWA was flown on the first of a series of route-proving trials from Renfrew, taking in Islay, Kintyre (Machrihanish), the Shetlands (Sumburgh) and Orkneys (Kirkwall), Aberdeen (Dyce), Inverness (Dalcross) and Edinburgh (Turnhouse). Most of the aerodromes were familiar names even in the 1930s, but aerodrome development during the War (principally for Coastal Command) resulted in the laying-down of hard runways and in some changes of site.

Kintyre's Machrihanish, for instance, which has four runways, lies to the west of the old Campbeltown field, and Islay's Port Ellen, with three runways, is a little south of the 1935 Bowmore. The pioneers might or might not have been glad of the runways, but would certainly have been glad of the VHF homers (if VHF had been developed) and of the lighting at Machrihanish, which includes a short sodium centre-line approach aid for the main 12/30 runway and threshold lights for this and other runways. They might have been glad, too, of the control towers—or "watch offices," as they were known when they were built during the War.

The Herald was flown to Scotland from Blackbushe on December 15 by a Handley Page crew led by Mr. John Allam, deputy chief test pilot, and was joined at Glasgow by B.E.A. pilots, including Capt. E. A. Starling, Renfrew flight manager, who was a captain with Allied Airways in the 1930s and who flew that company's first services across the North Sea to Stavanger, Norway, with a D.H.86. Laid out as a 38-seater, this first production Herald is equipped, for long-distance demonstration tour purposes, with navigator's instrumentation and equipment at the forward port-side passenger position. Panels carry two ADF indicators, a repeater compass dial, a two-needle A.S.I., an altimeter and an air temperature gauge, and there is a drift sight in the floor. Otherwise the interior is typical of a passenger-carrying version.

On the first day of the trials, the Herald was taken in to Islay (Port Ellen) and Campbeltown (Machrihanish), using the 4,096-ft. runway 22 at the former and the runway 16—the shortest, 2,965 ft.—at the latter and effectively demonstrating its short landing and take-off characteristics. More important still—at aerodromes such as these, which are encompassed by high ground—were the demonstrations of rapid climb-away and fairly tight circuits.

At Port Ellen the ground rises to more than 1,600 ft. to the north-east and to about 1,550 ft. within five miles of the aerodrome. Machrihanish is even more tightly placed, with high ground almost enclosing the aerodrome except to the west so that, when the clouds are sitting on the hills, it is rather like flying within an inverted basin with a broken lip opening on the Atlantic. Bad weather approaches are made from the west at both aerodromes after crossing the homers at safety height and letting down over the sea. There are two NDB, for reporting on Airway Blue 2 and holding, on the Kintyre peninsula, one north of Arran, at Skipness, and one south of Cambeltown.



The Herald on the apron in front of the control tower at Machrihanish (left) and (above) during its short stay at Port Ellen.

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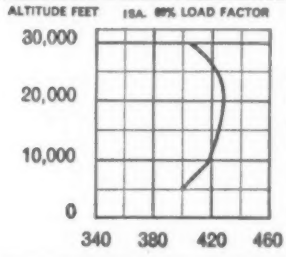
Only the VANGUARD

has this proved flexibility

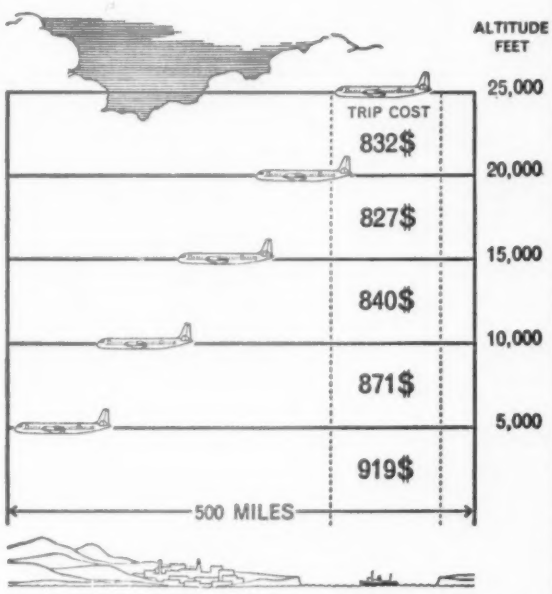
AIRLINE OPERATORS are invited to look carefully at this diagram and graph, and then compare the Vanguard's flexibility with their own experience of short haul operation on high-density routes.

It is easy to see that this remarkable aircraft can be routed at altitudes of from 5,000 ft to 25,000 ft and above, with practically no penalties in operating costs or speed.

The difference in direct cost between a 500-mile sector flown at 10,000 ft and one flown at an optimum of 20,000 ft is only $44 per trip. A cruising speed of over 400 m.p.h. is available between the height bands of 5,000 ft and 30,000 ft., so that schedules can be maintained irrespective of routeing instructions.



SPEED CAN BE MAINTAINED WHATEVER THE ALTITUDE ROUTEING INSTRUCTIONS



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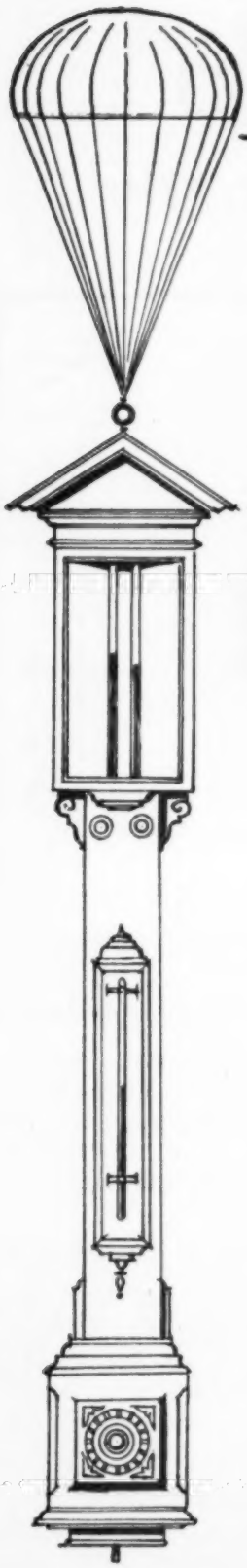

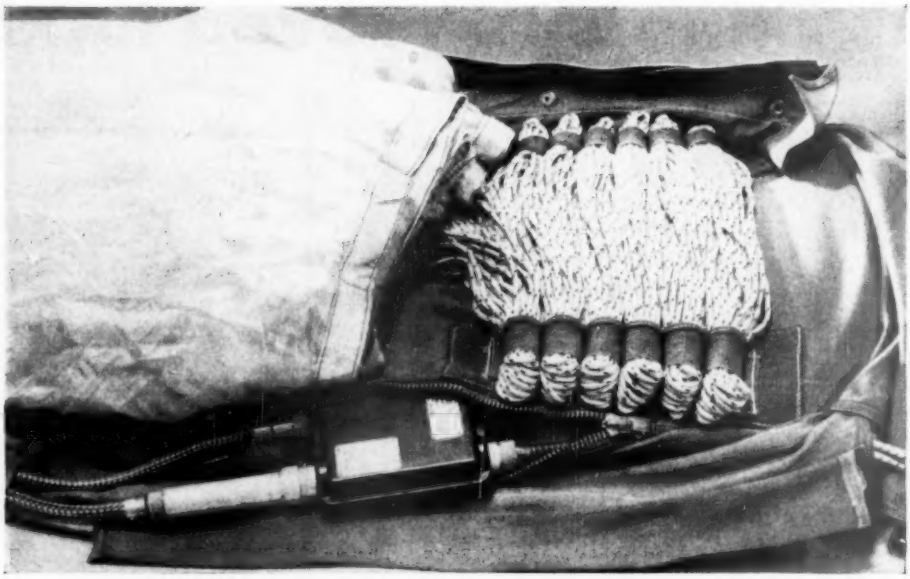

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Armageddon for Amateurs

By way of lighter relief in this earnest supersonic era, H. A. TAYLOR *recalls the days, only 20 years ago, when club-trained amateurs were teaching themselves to fly the first-line military aircraft of the day—breaking only one or two before reaching accepted professional status as test or ferry pilots.*

SO far during that first month of war-time ferrying as an Air Transport Auxiliary civilian pilot with the R.A.F. I had been allowed to fly Blenheims all by myself—since those were the things on which the Central Flying School had passed me out—and to look over the shoulders of the real ferry pilots while they took Wellingtons, Whitleys and Hampdens from here to there.

I had been given some dual ("can't be too careful with these chaps") in a taxi Anson and occasionally (when nobody else was available) I was allowed to take one of them empty between points on our daily rounds. For some reason or other Gladiators and Swordfish were considered to be no more difficult than grown-up Tiger Moths—so we were also allowed to ferry these. The big boys can hardly have known what they were missing when they let these magnificent old devices go to the amateurs.

That was the limit, for the time being, of novitiate adventures with the military monsters. But one day an orphan Hurricane remained outside the day's overall plan of ferrying movements. I, also, had somehow been left out of this same plan. It remained, therefore, for me to take this horrific fighting aeroplane from Filton, Bristol, to Shawbury, whence, with a little reorganization, I would (subject to safe arrival) be ferried over to Liverpool to collect yet another Blenheim.

I climbed aboard the Hurricane and was shown the "taps." Not so very difficult except for an hydraulic power control which had to be held down after selecting undercarriage or flaps. All very nice in theory, but this additional action meant that, with only two hands, either the control column or the throttle had to be left to its own devices whilst this infernal lever was pressed. I supposed that I'd be able to manage.

It was a very cold day during the November which was hunching itself up for the rigours of that terrible 1939–40 winter. Two strokes of the priming pump would, I thought, be adequate for a clean start. The trolley was plugged in, I worked the primer and pressed the starter button.

A few miserable coughs were the best that could be produced as the Merlin engine turned and the throttle was worked. Another stroke of the primer produced another series of asthmatic grunts. "Let me have a go—sir," said the flight sergeant. I struggled out of the cockpit and, with no impeding parachute, he leapt lightly aboard. The engine fired immediately. "You have to give her three or four strokes of the pump in this weather," he said. And I wondered, as I taxied out, whether I'd looked just a little too relieved when the Merlin wouldn't "take." Well, there was no point in worrying now about whether Mr. Freud or Mr. Jung had played some part in the inadequate performance.

As I opened the throttle for take-off I comforted myself with the thought that the cowling, over which I was aiming at the distant scenery, was not so very unlike that of the Battle I had flown alone

(except for human, A.C.2, ballast) at C.F.S. a month or so before. The thing bounced twice and then we were airborne. Well, I wouldn't need to worry much now for half an hour or so.

I moved my left hand from the throttle to the control column, selected undercarriage up with my right hand, pressed the power lever and waited for the red lights to appear. My microcosmic world became strangely silent as I waited. Had the engine failed? No. The untended throttle lever had merely vibrated back to a near-closed position. I had forgotten, before take-off, that "T" stood for "throttle tightener" as well as for "trim" in the vital-action mnemonic.

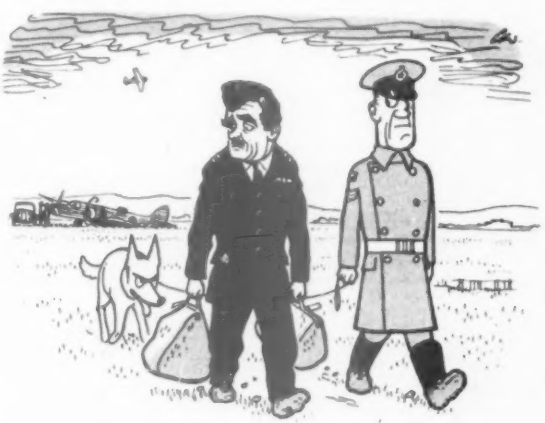
This little emergency successfully passed, I brought the throttle back to rated boost and looked for the means of changing the propeller pitch. The military aeroplanes which I had so far flown were, except for the C.F.S. Harvards, fitted with two-pitch propellers. This Hurricane's propeller control had a lever like its throttle.

Ah, I thought, they are fitting these fighters now with constant-speed propellers. Cautiously I moved the lever back, expecting the revolution-counter needle to follow. It did—but went on moving back. Deciding that this must be a very delicate control, I inched the lever forward again. The needle climbed rapidly back to 3,000 r.p.m. and the situation became a very noisy one. Presently I decided that the constant-speed unit must have failed, but continued to try to catch the engine-speed changes as they occurred and eventually learned to be quite expert at the trick whilst map-reading my way up the Severn Valley to Iron Bridge (with the Wrekin ridge over on the right) and so to Shawbury.

The landing, my first with a Hurricane, was tolerable, but I could hardly wait to report my little trouble to the engineer officer at the maintenance unit. He peeped round the front of the engine, assured me that it really had a two-pitch propeller and said that he would inform 41 Group Headquarters that he had found a unique being—a successful human replacement for the constant-speed control.

* * * * *

From that moment things began to look up for at least a few pilots among our untrained mob of strangely uniformed interlopers. Eyebrows were no longer raised as we continued to complete the



days' quotas of aircraft movements without breaking anything—but, then, they weren't raised either when I did, in the end, wreck a Blenheim in the quagmire which was Little Rissington. Trying virtuously to save the flaps from the batterings of mud and stones after touch-down, I had succeeded only in raising the undercarriage.

By the time the duty crew had shovelled the remains into the corner of a hangar night had fallen; no taxi Anson had arrived and I spent an embarrassed evening in the Mess considering my unique position under King's Regulations. Would a posse of R.A.F. Police come to collect me in the morning and would this frightful *gaffe* be the end of the A.T.A.?

The powdered-egg decoction for breakfast the next morning tasted even more like cardboard than usual as I thought out possible excuses for the accident. But there were still no telephone calls from irate brass-hats and no posse of policemen.

I collected my overnight and parachute bags and waited in the hinterland of flying control. Presently a familiar Anson landed and taxied in. At least, I thought, I would be travelling in comfort to my court-martial. I moved forward with my wrists ready (so far as parachute and overnight bags permitted) for the gyves.

"Come on, come *on*," the pilot yelled, as I clambered in, "you're

down to take a Henley to Shawbury and a Blenheim from Woodford to Aston Down. I'm dropping you at Brockworth after I've picked Joe up at Kemble."

* * * * *

Weeks later I was most politely told to be a bit more careful in future with the Blenheim's hydraulic controls. Mistakes *will* happen—and so forth. "Now," the C.O. continued, "there's a Hereford from Belfast to Aston Down. Think you can cope? Just like a Hampden, only noisier. Off you go; the Anson's waiting."

Of course, there wasn't always an Anson waiting and not all R.A.F. units had heard about the Air Transport Auxiliary. Once or twice, stranded at some out-of-the-way place, we had to go down on hands and knees to the adjutant before he would give us railway warrants and Service transport to the nearest station. On one occasion I got under way back to my base only because the Station Commander was kind enough to let me have the use of his own car.

"You see," he said, "there's nothing in the *book* about the A.T.A. Had you been dressed in a *proper* uniform you'd have got transport and a warrant without question. Now, get along and don't keep my driver waiting while you look up the times of the trains. A.T.A., eh? If you'd told the adjutant that you held a commission in the Tanganyika Air Arm I expect he'd have given you a warrant and transport without batting an eyelid. Funny chaps, adjutants. Good luck."

Horrors of war? For us, they were constituted by the railway system in winter when coal supplies were being conserved by turning off the carriage heating. The losses in working time, because of chills caught in trains, probably added up in cost to a great deal more than the saving in lumps of coal. *The Times* was the best newspaper for such journeys; the format was suitable for wrapping around the legs and the material seemed to have better lagging qualities than most. Luckily, our very complicated taxi-Anson pick-up schedules usually worked out according to plan.

* * * * *

After my first month of ferrying, with 30 hours and nine different aircraft types recorded, I awaited the commanding officer's end-of-term comments in my pilot's logbook with special interest. "You are," he wrote in it, "getting your airframe and engine entries confused. This is an official document and must be treated as such."

You just can't win.

AIRSHIP NOTES *by Lord Ventry*

IN Germany the airship belonging to AVO, the international air advertising concern of Frankfurt, is now advertising for Haus Neuerberg of Cologne. With the original envelope she was known as the Underberg, and did 2,000 hr. flying. She is now known as the Guldenring, for she is advertising cigarettes of that name. The old envelope was 123,000 cu. ft.; the new one is 158,000 cu. ft.

This airship has done more than 400 hr. flying this season piloted by Helmut Gülsdorf. He was trained last year by Herr Gerart Schmidt, the previous Underberg pilot who is now in charge of Germany's second airship, the Trumpf, which has already flown some 400 hr. or more this year. She is the same size as the Guldenring, but has reversible propellers and an auxiliary blower which are real aids in landing—especially when there is no wind to slow the ship down.

I flew in both ships earlier this year—the Guldenring at Brunswick, and the Trumpf at Kassel—doing over 10 hours flying in the three days I was with them. I also saw many short flights being made. Judging by the way people waved as we passed over, even swimmers did so, these airships must have considerable publicity value.

It is only from an airship car one seems to get a real bird's eye view of the countryside and there is little noise, no vibration, and plenty of room. Once both engines of the Trumpf were stopped, and we did a few moments of free ballooning. The ship was a little heavy so we fell slowly, but when the engines were restarted we soon regained our normal altitude of 700 ft.

The take-offs and landings were models of their kind. We left the ground once like an aeroplane, taxi-ing off, and landed in the same fashion. Otherwise we went up nearly vertically, and made proper airship landings "on the guys."

There is talk of Metallwerk, the Zeppelin successors, putting up a shed at Friedrichshafen and building non-rigid airships. A shed is also being constructed at Essen Mulheim for Trumpf; the craft will probably be docked and undocked while on a "belly" mast mounted on a crew bus, Goodyear fashion.

Boys and girls of the local glider clubs were doing good work with the airships, helping the permanent crews which were about nine men strong. The cotton neoprene envelopes only take some 3,000 cu. ft. per month for topping up, and are a great credit to Ballonfabric, Augsberg, which built them.

The mooring masts, combined with skilled handling and the keen efficiency of the ground parties, have made these operations possible. The mast is the Scott Pulham mast shrunk from 110 ft. to 30 ft. in height. Goodyear and the U.S. Army and Navy have of course done much since, and the Germans are now making good use of it all.

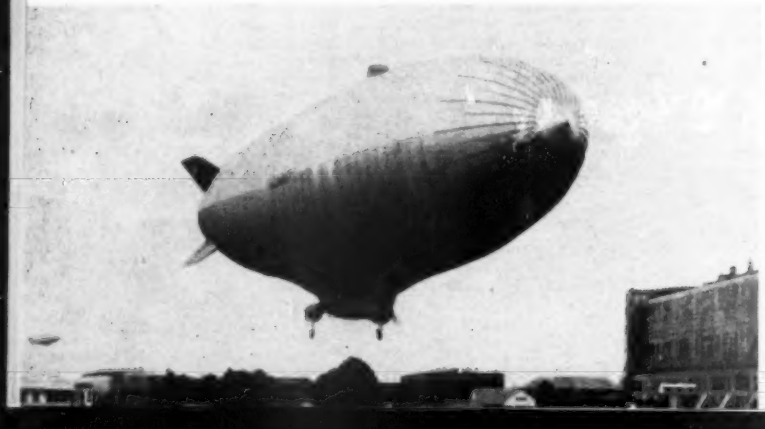
I flew in the Guldenring with Herr Forrer, who holds current licences for aeroplanes, airships, balloons, gliders and helicopters. This must be a European record.

Goodyear has recently released some details of airship work in the United States. The first of the ZPG-3W class, of early warning airships, has flown to Lakehurst in the course of a 70-hr. flight; Walter Bjerrex, with whom I flew in 1949, was the pilot. She is the largest non-rigid airship so far built, with a volume of 1,516,300 cu. ft., and a length of 403 ft.

A crew of 24 is carried in the double-decked car, 83 ft. in length, roomy crew quarters being on the top deck. She is powered by a pair of Curtiss Wright engines totalling 3,000 b.h.p., driving fully feathering, reversible 18-ft.-dia. propellers.

Top speed of this ZPG-3W is around 80 m.p.h.—cruising speed being some 60 m.p.h., according to circumstances. She can climb at 2,400 ft. per min. from m.s.l., valving capacity being such that she can lose at least 1/30th of her volume for each 1,000 ft. gain in altitude.

There is a large radar installation in the envelope, which is used as a radome. To avoid hitting the ground with the bottom fin when taking off heavy, the control and stabilizing surfaces form a cross "saltire" in section. These surfaces are termed ruddevators and have proved very efficient in allowing airships to turn at very high speed.



Above, the new German Guldenring airship has a top speed of about 63 m.p.h. Left, the American ZPG-3W landing a Lakehurst, N.J.

The useful load of the craft is stated to be 22,907 lb., and it is expected that the first ship of the four which are to be built, will join up with the Airship Airborne Early Warning Squadron 1, at Lakehurst in October, 1959.

The Office of Navy Research has given a grant to the Mississippi State University for research to be carried out into boundary-layer control of airship envelopes. This work is being done under Dr. Raspet, head of the University's Aerophysics Department, using a 5K class airship at Lakehurst.

A "laboratory" has been built into the airship's bottom fin, and two men will be carried in it. The boundary-layer will be measured by means of 20 pitot tubes. It is hoped that it will prove possible either to increase an airship's endurance threefold, or add 40% to the maximum speed. This will presumably produce a crop of pressure problems. But it does look as if the speed of airships will be increased—and without having to sacrifice their other good points because of the fact that they are displacement vessels and so true ships of the air.

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Airborne in the S.E.5a

This article was specially written for us by CDR. K. R. HICKSON, A.F.C., R.N., *Commander Flying, R.A.E. Farnborough. In this capacity, he flies most Service types up to and including the V-bombers, on which he is one of the few naval aviators to qualify. The S.E.5a was something of a departure even for him.*

MANY readers will probably know that S.E.5a No. D.7000 has recently been rebuilt by the apprentices of the Royal Aircraft Establishment for the Shuttleworth Trust. This fine First World War aircraft was rebuilt from a fuselage residing in a hangar belonging to Sir W. G. Armstrong Whitworth Aircraft, Ltd. It was fitted with a 200-h.p. geared Hispano engine and by the generosity of a vast number of companies and private individuals, many components were offered from the depths of their various stores to enable the R.A.E. to "jack up the end of the stick" and build a complete aircraft around this original control column. The archives of the R.A.E. yielded a set of drawings and some of the more senior "apprentices" had had experience in building the original production aircraft.

After some two years of work and the knocking down of a wall or two to enable the fuselage to be got out of the back room where it was built, this shining and beautiful aircraft arrived on the tarmac. Due homage was paid by the older members of the Establishment, many photographs were taken and much reminiscing was allowed before the engine runs were complete and the aircraft ready to fly.

For my part it was fortuitous that my Group Captain was temporarily grounded at the time when the aircraft was ready to fly. It cost a lot of blue ink and brown ale to arrange my participation in the flying in his place. And, of course, such a chance could not be missed without consolidating my position to the extent of "hogging" some five exhilarating trips.

The grass at R.A.E. is seldom used for aircraft landing purposes so the first task was to sort out a series of strips of adequate lengths in various directions and free from natural hazards and pitfalls. This proved quite a problem and for some days a Chipmunk could be seen bouncing all over the airfield thoroughly antagonizing the normal users and frightening the air traffic control staff.

Eventually the great day arose for my first solo. Cockpit and system briefing was simple and to the point. Flying briefing was based on the experience of Air Commodore Wheeler, who had flown one trip in it: "Take-off into wind, approach at 55 m.p.h. and three-point it."

The aircraft "looked right" so that I felt sure its flying characteristics would be good. Even so when one normally flies the R.A.E. fleet of aircraft one approaches something like the S.E.5a with a certain amount of trepidation.

Entry into the cockpit was by climbing, in the true sense of the word. Possibly the footstep position was designed for the Mark 1 standard man with longer legs and a shorter body than mine. Having got in, I found myself firmly wedged across the shoulders due to the hole in the fuselage not being large enough. The cockpit layout is good and there are a surprising number of instruments for an aircraft of that age.

On the port side under the seat is an elevator trimmer, operating a variable incidence tailplane; ahead of this is the handpump and its cock for pressurizing the main fuel tank; and above is the Bowden cable control for the radiator shutter. The throttle and compensator are on the port wall of the cockpit and in appearance are quite unfamiliar, being straight pieces of metal with small knobs.

On the left of the instrument panel, below the machine-gun, are two cocks and their associated plumbing; one is a fuel selector and the other a tank pressurizing air selector. There is an engine-driven air pump which pressurizes the main fuel tank in order to feed the carburetter (the two being level). The handpump takes care of

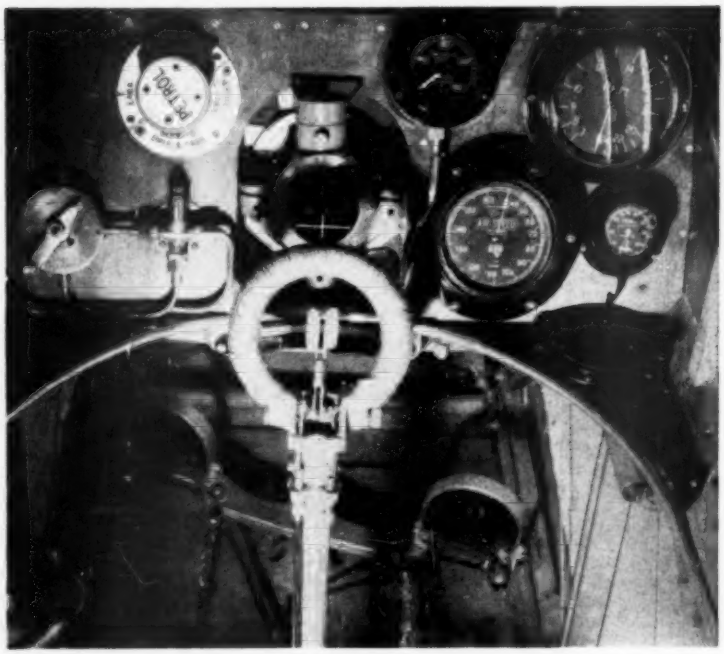
engine-driven pump failure, and starting. There is also a fuel tank in the top centre-section and fuel can be transferred between tanks.

Misuse of this system can lead to the centre-section tank overflowing into the left eye in flight or down the left trouser leg on the ground. The fuel gauge is on the rear face of the main tank and can be seen between the top of the instrument panel and the fuselage skin. The flight and engine instruments consist of a compass, an oil pressure gauge, a coolant temperature gauge, a tachometer, an A.S.I. and an altimeter which is mounted horizontally and adjusted by moving the whole face. Initially this was too loose and vibration slowly added altitude to the instrument so that it indicated 6,000 ft. when flying past the control tower.

On the starboard wall are the main mag. switches and the starter mag. and its switches. The latter mag. is cranked from outside the cockpit just behind the exhaust pipe. Its position leads me to believe that this was normally cranked by a fitter or by the pilot prior to strapping in, unless the standard man of 1917 was a different shape.

The fighting equipment consists of two 0.303 in. machine-guns, one a Vickers firing through the prop and mounted on the port upper side of the fuselage with the rear of the breech level with the instrument panel, and the other a Lewis [allegedly used by Ball.—Ed.] mounted above the centre-section of the mainplane. This latter gun is on a rail and can be brought to a vertical position just in front of the pilot's face for the changing of magazines and in some cases for firing.

There is an official stowage for spare magazines and plenty of room on the starboard wall for making *ad hoc* arrangements. The guns are fired independently or together by Bowden cable attachments to two levers in the centre of the spade grip on the control column and convenient for thumb operation. This spade grip had a remarkably modern look about it despite being an original.



"The cockpit layout is good and there are a surprising number of instruments for an aircraft of that age."

Having found one's way around the cockpit and got strapped in by means of an eight-inch wide leather and fabric strap, the next process is to get started. This is often lengthy, and obviously "readiness" was a later innovation. First the main fuel tank is selected, labelled "Service to Carb.", then the pressure air cock is switched to "Engine and Handpump to Service" and the air pressure pumped up by hand to about 2½ p.s.i.; the throttle is set about ¼-in. open and the compensator (mixture) to fully rich.

At this stage, an aged retainer climbs high enough to reach the four brass priming cocks on the two induction manifolds and with the aid of a large brass syringe, a portion of fuel is injected through each cock. The engine is then turned over to suck in the mixture and one cylinder put on compression.

Both mags. are switched on, and the starter mag. put to contact. The fitter then cranks this and if the fates are kind the engine kicks backwards and fires in the correct direction to pick up fairly quickly. For this process a fitter should be on the tailplane.

If this method is not effective after being repeated a number of times, the Hucks starter is brought into being for this particular model, and the engine turned over continuously until it springs into life. This assumes that the Hucks can be coaxed into life.

After checking the engine-oil pressure above 40 p.s.i. and no violent explosion or banging on switching off either mag.—chocks can be waved away, the fitter removed from the tail and the aircraft taxied. There is a steerable tail-skid spring-loaded on the rudder, and a reasonably slow tick over, so that taxi-ing into wind on smooth grass is very pleasant. The view over the nose is obstructed, but a little swinging easily gives one adequate coverage.

The undercarriage is bungee-sprung and is narrow, so that taxi-ing crosswind or on bumpy ground gives one great misgivings, particularly if the wing tips are watched. If there is any doubt about the wind strength, i.e. above about 10 knots, ground personnel should remain at the wing tips.

The aircraft should be lined up into wind, a quick check made of tank air pressure, fuel, elevator trimmer (to neutral) and oil pressure; then with caution, full power is applied (having first adjusted one's goggles and fur-lined helmet). There is a slight tendency to swing which can easily be corrected by application of rudder. In an amazingly short kangaroo-like run the S.E.5a becomes airborne at about 45 m.p.h.

Speed is allowed to build up to about 65 m.p.h. and the aircraft will climb very sharply.

The first impressions are of the pleasant feel of the controls and the great sense of power—this latter is very impressive.

The S.E.5a throughout has been handled with care because there are no spares available for the engine or airframe and every effort has been made to preserve the rebuilt Hispano engine for its overhaul life of 50 hours. Ceiling climbs and such have not been carried out and manoeuvres have been restricted to positive-*g* only.

In straight and level flight at 2,000 ft. a level speed of 134 m.p.h. was indicated. The main impression one gets of the aircraft is that it is pleasant to fly; the ailerons feel peculiar at first because they are non-differential. The control circuit, being a box type, has much static friction and hence the ailerons are not self-centring. On their initial application, the first response is in yaw—this is apparent by the airflow on the cheeks and the peculiar feel in the seat of the pants—thus co-ordinated rudder is necessary whenever aileron is applied. The controls are progressive in feel throughout the speed range and the response good except as indicated above.

On throttling back the engine to approach the stall and passing through the low power ranges, considerable high-frequency vibration is felt. This is very frightening when heard from the ground and is

"After checking the oil pressure . . . chocks can be waved away, the fitter removed from the tail and the aircraft taxied." Air Cdre. Wheeler of the Shuttleworth Trust was the pilot of the S.E.5a on this occasion.

Photographs copyright "The Aeroplane and Astronautics"

due to backlash in the reduction gearing. When fully throttled back a more peaceful state of mind can be achieved.

As the stall is approached, a general lightening in the controls is felt, with slight airframe buffet at about 44 m.p.h. The aircraft becomes fully stalled at 42 m.p.h. I.A.S. with the stick fully back.

The stall consists of a slight drop of the nose and of either wing. All controls are effective at the stall, although the peculiar aileron feel is emphasized. There is no tendency to spin and recovery can be effected with less than 100-ft. loss of height. Engine response is good and it can be used to assist in recovery if required.

Aerobatics are a pleasure in the looping plane provided the slipstream is kept blowing equally on each cheek. With the high available power, the loop can be started from as low an airspeed as 90 m.p.h. and continuous loops performed without loss of height. For the roll off the top, 110 m.p.h. is a better speed and care must be taken to keep the roll straight. The stall turn is a convenient way of changing direction and is a very pleasant manoeuvre if the aircraft is held in a vertical climb until the speed drops to under 50 m.p.h. then rudder applied.

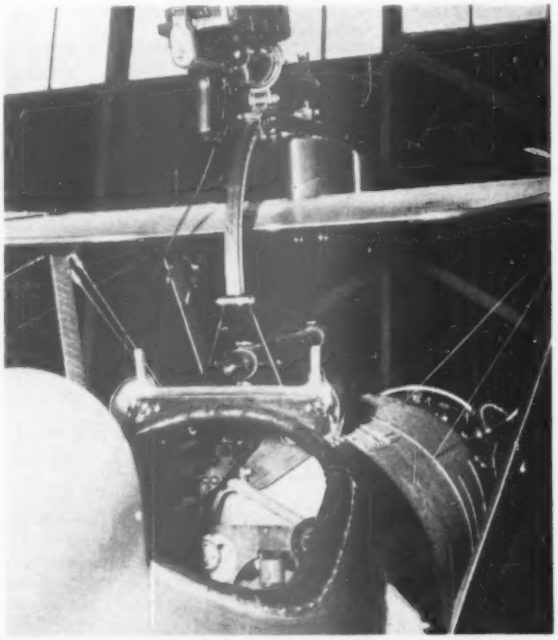
A roll is the most difficult manoeuvre, for reasons already explained, but provided one co-ordinates the controls to keep the wind equal on each nostril, all is well. At high speed, the ailerons are reasonably heavy for large control movements, but the roll can be satisfactorily performed from speeds as low as 85 m.p.h.

The approach to land gives one the greatest confidence; the initial approach should be at 60 m.p.h. reducing to 55 m.p.h. for finals. Power-off approach is not terribly steep, and all the controls are effective with good response. Care must be taken not to round out too high and the landing must be into wind. Every effort should be made to make a three-point landing. If this is achieved and the stick held fully back after landing the ground-run in zero wind is about 45 yards.

Rudder control is good down to about 25 m.p.h., after which the steerable tail skid gives adequate control. If by mischance the main wheels touch first and the ground is the least bit uneven, an ever-increasing series of bounces take place which can best be remedied by opening up and going round again.

The most difficult part of the landing is appreciating the nearness of the ground when in the three-point attitude, particularly when one is used to modern aircraft. Crosswind landings should not be attempted. If they are, there is a distinct tendency to swing into wind on touchdown, which usually results in a ground loop.

At this stage one realizes how exhilarating the trip has been, and the immediate reaction is to taxi round again for another take-off. The confidence this aircraft gives one is far, far greater than that achieved in any modern aircraft and one marvels at the excellence of the aerodynamic design of that day. Could it be that in those days the pilot had a greater say in what he liked?



(Right) ". . . a Lewis mounted above the centre-section of the mainplane." (Below) "In an amazingly short kangaroo-like run the S.E.5a becomes airborne at about 45 m.p.h."

Aviation's Ten Best Books

A Pilot's Selection—by John Fricker

ANYONE who attempts to dogmatize on what constitutes the best of aviation literature is asking for trouble, since so much depends on personal interpretation. I would go so far as to say that there has been remarkably little true literature on aviation during its fairly brief history, but it is not my purpose here to define what is constituted by this expression. Instead, I would like to steer a less controversial course and discuss those books which I consider have best interpreted the poetry and drama of flight over the past 50 years.

As a breed of men, pilots are notoriously inarticulate. Indeed, anyone in this country who attempts to be otherwise is regarded with great suspicion, so strong is the tradition of British reticence. This artificial inhibition has probably been responsible for depriving us of a wealth of perceptive aviation writing, since only a personality which has been moulded by close and prolonged contact with the natural and artificial hazards of flying can interpret this alien world to the layman.

Inevitably, then, a pilot's choice of flying literature is prejudiced towards works by other pilots. In this Christmas selection, I am going to browse happily through 10 of the better examples and, by quoting extracts which have appealed to me, I shall endeavour to convince flying and non-flying readers alike of the justice of my choice.

I shall not be surprised if many people have not heard of some of the older books which will be mentioned, although most of the titles will be familiar to enthusiasts. The 10 volumes selected span the best part of flying's 50 effective years and therefore exclude the many excellent earlier works by such pioneers as Bacon and Coxwell.

Not unnaturally, World War I provided the first real flow of vital aviation writing and the only difficulty here is to select one or two of so many outstanding books produced at that time. Such titles as McCudden's "Flying Fury," "Fighter Pilot," by McScotch, and "An Air Fighter's Scrapbook," by Ira Jones, immediately spring to mind for their graphic representation of the new "sport" of aerial combat, from the Allied point of view; while from the enemy came Richtofen's "Red Air Fighter" and Udet's "Ace of the Black Cross."

For the most vivid (and virile) descriptions of a wartime pilot's life, on the ground as well as in the air, I unhesitatingly nominate the late Elliott White Springs. This American pilot, who died very recently (on October 15) aged 63, learnt to fly and fight with the R.F.C., and was eventually credited with the destruction of 11 enemy aircraft. It was not merely his fighting prowess, however, which made his books so fascinating but his ability to convey the brittle atmosphere of a wartime fighter squadron in action on the murderous Western Front and the almost-as-violent off-duty relaxation of its members.

This ability was tacitly acknowledged by Nevil Shute in his recent "Rainbow and the Rose," which relied heavily on Springs' classic "War Birds" for background. "War Birds" was first published in the U.S. as "The Diary of an Unknown Aviator," but, on becoming a best-seller, the editorship (from material collected by John McGavock Grider, who was killed in 1918) was eventually acknowledged by Springs. He went on to write several stimulating books of a similar nature to "War Birds," which was made up of this kind of material:—

> "The new flight commander . . . was out on D.H.2s. He was shot down by Richtofen. He says that Richtofen may have the reputation of being a good sport, but that he showed him no mercy—shot his engine up and then followed him down while he was trying to land and shot him three times. He got one bullet in his rear and they had to cut off a slice. He sits down and leans like the tower of Pisa. Cal said he'd be fine for sitting on stairs. He went up to have a look at the lines and crashed landing and turned over on his back. That's the trouble with these S.E.s: they don't like the ground."

On a gentler note, another of my favourite air books on the First World War is "Sagittarius Rising," by Cecil Lewis. This is written in a more bitter-sweet and nostalgic style and conveys a poignant impression of the author's youth and sensitivity, as well as the futility of war. Cecil Lewis flew S.E.5s with No. 56 Squadron, and this extract from "Sagittarius Rising," describes part of the dog-fight in which Ball was killed.

> "The game of noughts and crosses, starting at 15,000 ft. above the clouds, drops in altitude, engagement by engagement. Friends and foes are scattered. A last S.E., pressed by two Huns, plunges and wheels, gun-jammed, like a snipe over marshes, darts lower, finds refuge in the ground mist, and disappears.
>
> "Now lowering clouds darken the evening. Below, flashes of gun-fire stab the veil of the gathering dusk. The fight is over! The battlefield shows no sign. In the pellucid sky, serene cloud mountains mass and move unceasingly. Here where guns rattled and death plucked the spirits of the valiant, this thing is now as if it had never been! The sky is busy with night, passive, superb, unheeding."

Between the Wars there were perhaps fewer aviation books of similar stature and most of the descriptions of pioneer flights are unfortunately lacking in literary finesse. Perhaps it is too much to expect to find in one person the qualities needed to launch off into the cloud-filled night across hostile seas in a fragile, single-engined biplane, and the imagination subsequently to recapture his (or her) emotions on paper.

There are, of course, exceptions to this rule. The most notable in aviation in undoubtedly Antoine de Saint-Exupéry.

It is impossible to exclude this French pilot-author from any selection of outstanding books on flying. Nor would one wish to; but, once again, the only problem is to decide which of his books, with their profound and yet uncomplicated philosophy, to select. There is little to choose in communion of feeling and spiritual quality between "Wind, Sand and Stars," "Night Flight" or "Flight to Arras," save for the bitter anguish underlying his wartime works, although his posthumously published writings draw their inspiration from wider sources than aviation.

For its essential humanity, maintained in the face of the most hostile natural elements, and also of man-made hazards, I would choose, I think, "Wind, Sand and Stars." But Saint-Exupéry is not all philosophy and he has earned an unrivalled place in aviation literature for his descriptive power alone. Consider his account of a seaplane take-off:—

> "The motors are running free and the plane is already ploughing the surface of the sea. Under the dizzying whirl of scythe-like propellers, clusters of silvery water bloom and drown the flotation gear. The element smacks the sides of the hull with a sound like a gong, and the pilot can sense this tumult in the quivering of his body. He feels the ship charging itself with power as from second to second it picks up speed. . . . He closes his hands over the controls, and little by little in his bare palms he receives the gift of this power. The metal organs of the controls, progressively as this gift is made him, become the messengers of the power in his hands. And when his power is ripe, in a gesture gentler than the culling of a flower, the pilot severs the ship from the water and establishes it in the air."

Perhaps only the French, who are the most articulate race in the World, can write like that. But many have approached a similar standard, as these thoughts of Lindbergh, on leaving the coast of North America for the first transatlantic crossing in the "Spirit of St. Louis," show:—

> "Why waste these minutes on thoughts of crashes or incidents that are past? This is my last hour of America and day. Whatever may come later, it shall be filled with life. I fly low across these last mountains, close to their granite summits, exploring ledges and crevasses no man has seen before. I skip over precipice and canyon, the ground now 50 ft., now 1,000 ft. beneath. I've never felt so carefree of terrain. Why should I concern myself with engine failure; I, who have flown above Nova Scotian forests and ice fields of a northern sea; I, who am about to take on the entire ocean and the night? What joy it is to fly past crags like an eagle, to glide fearlessly over the edge of these great cliffs. From now on, the explosion of the engine will be

(*Continued on page 661*)

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(*Continued from page 660*)

inseparable from the beat of my heart. As I trust one, I'll trust the other."

This powerful autobiography must be acknowledged as a classic in aviation literature, to which the Americans have made several notable contributions. Another, dealing with a later period, is "I Wanted Wings," by Beirne Lay, Jr.

It is a curious thing that the first book of any author, particularly when dealing with his own experience, is nearly always the best he will ever write. Experience in writing does not apparently count as much as the intensity of feeling that first causes one to put pen to paper, to share one's emotions and reactions with one's fellows.

Thus, although Beirne Lay wrote other aviation books, including "12 o'clock High," he never again achieved the vividness of "I Wanted Wings," which almost brings the tang of dope, petrol and rubber, and the sound of the wind in the wires, into the reader's presence—as this passage, I hope, demonstrates. It also provides an interesting contrast with Saint-Exupéry's treatment of a similar subject.

"I square into wind, glancing quickly up and back to see that nobody's coming in to land on top of me. I am merely sitting out there on the field motionless, strapped in a metal seat that is yoked up to six times as much power as you have in your car—if it's a 100-horsepower model. When I full-throttle a big drink of high-test gas into the Conqueror it responds by yanking that metal seat right out from under me. . . .

"The stick begins to come alive. Messages from the ailerons and from the tail surfaces creep from the rubber grip into my hand. The forward pressure necessary to hold the tail up diminishes, and I let the stick come back. The P-6 is humming along in flying position with scarcely enough weight left to hold its wheels to the ground. I curl my fingers slightly back, and now the air alone supports me."

A British book which brings the biplane days of the R.A.F. sharply back into focus is F. D. Tredrey's "Pilot's Summer." This describes the author's participation in an instructor's course at C.F.S. in the mid-'thirties and includes accounts of flying such types as Avro 504Ns, Tutors, Atlases, Bulldogs and Harts. There is more than technical interest in his description of these veteran types, and he succeeds in conveying much of the atmosphere of those halcyon days. These were perhaps typified by this colourful description of a characteristic scene at Wittering.

"A grand blue and silver day, great cloud countries rolling down the sky at 4,000 ft. and a stiff, gusty, changing wind over the aerodrome. The usual bustle of activity on the tarmac and around the hangars at 8 o'clock, rows of Tutors lined up, brave in the sunshine with their blue or red belly-bands, pressing back against the wheel chocks and rocking fitfully in the headwind, waiting to be started up.

"A silver Fury with a single cockpit half-way down the fuselage and a long polished nose gleaming like quicksilver in the brightness. Three green and silver Bulldogs, old single-seat fighters, roaring overhead at 800 ft. doing close formation drill for Empire Day. Then higher up, at 3,000 from the other direction, five Tutors stream down in line ahead. The leader rolls over on to his back, half loops off and heading on a reciprocal course, nose down, roars at the aerodrome. Each plane follows suit, and they do a power dive over the sheds at 300 ft."

I came across that book by accident, and it is my feeling that it is not as well known as it should be. Everyone, on the other hand, has heard of "The Last Enemy," and with good reason. Richard Hillary showed the most astonishing maturity—he was only 23 when he was killed in a flying accident—and he was that rarest of commodities, a highly articulate British pilot. His outlook was sharpened by much suffering, and his intellect drove him to a frantic self-analysis, which was complicated by his facial disfigurement.

In some ways, therefore, flying is almost an incidental in this book, except for its vital part in the development of its author's character, but it is analysed as thoroughly as everything else by Richard Hillary. These were his thoughts before flying his first Spitfire:—

"The dull grey-brown of the camouflage could not conceal the clear-cut beauty, the wicked simplicity of their lines. I hooked up my parachute and climbed awkwardly into the low cockpit. I noticed how small was my field of vision. Kilmartin swung himself on to a wing and started to run through the instruments. I was conscious of his voice but heard nothing of what he said. I was to fly a Spitfire. It was what I had most wanted through all the long dreary months of training. If I could fly a Spitfire, it would be worth it. Well, I was about to achieve my ambition and felt nothing. I was numb, neither exhilarated nor scared. I noticed the white enamel undercarriage handle. 'Like a lavatory plug,' I thought . . . and I realized I had spoken aloud."

Many other aviation books have been written on World War II; a number of them measure up reasonably well to "The Last Enemy," but none surpasses it. In the bomber field, the two outstanding works are "Bomber Pilot," by Leonard Cheshire, and Guy Gibson's "Enemy Coast Ahead." Here, I shall choose the latter, largely because of its enormous vitality, and for the simple power of its author's prose. This is particularly apparent in the memorable description of the epochal dam-busting raid, as the following extract shows:—

"The gunners had seen us coming. They could see us coming with our spotlights on for over two miles away. Now they opened up and their tracers began swirling towards us; some were even bouncing off the smooth surface of the lake. This was a horrible moment; we were being dragged along at four miles a minute, almost against our will, towards the thing we were going to destroy. I think at that moment the boys did not want to go. I know I did not want to go. I thought to myself, 'In another minute we shall all be dead—so what?' I thought again, 'This is terrible—this feeling of fear—if it is fear.' By now we were a few hundred yards away and I said quickly to Pulford, under my breath, 'Better leave the throttles open now and stand by to pull me out of the seat if I get hit' . . . I thought he looked a little glum on hearing this."

One more war book that must be mentioned is Pierre Clostermann's "The Big Show." This is written with a loving attention to detail that constantly brings the reader into the picture and is undoubtedly an air-fighting classic of World War II.

Unrestrained by British reticence and inhibitions, Clostermann presents a living and vital commentary on R.A.F. fighter combat throughout most of the War and an incidental reminder that, in the drive to Germany, casualties were by no means light despite overwhelming air superiority. It would be interesting to read his comments on his more recent operational flying in F-84Fs over Suez, and with the French Air Force in Algeria.

Almost all of "The Big Show" is quotable, but this paragraph is typical of the vivid detail it contains:—

"Within range at last! I jammed my thumb down on the button and my wings shuddered with the recoil of the cannon. With one motion of the stick I made the luminous spot of my gunsight travel along the Hun, through his propeller slowly churning through the air like some pathetic windmill. I was now so close to him that every detail was clear. It was one of the latest 'long noses' (F.W. 190D) with a Daimler-Benz in-line engine. I could already see the little blue flame of the exhausts, the oxide trail left by the burning gases along his fuselage, his emerald green back and his pale belly like the pike I used to fish for in the old days in the Mayenne. Suddenly the sharp clear picture shook, disintegrated. The gleaming cockpit burst into fragments. My 20-mm. shells tore into him, advancing towards the engine in a series of explosions and sparks that danced on the aluminium. Then a spurt of flame, thick black smoke mingled with flaming particles."

My final choice in this Christmas selection ends on a more peaceful note, with someone, I am glad to say, who is still an active pilot after one of the most distinguished test-flying careers on record. Harald Penrose is not only an articulate pilot, but he also writes with a blend of lyrical and philosophical styles which hitherto has been confined to such a master of aviation writing as Saint-Exupéry. My only criticism is that we have not heard enough from him.

Now that he has finished with test-flying, perhaps this will be rectified. In the meantime, let us close with his reaction to the ending of a brilliant and hazardous career.

"Year after year the skies had been mine—the eternal skies, magically repainted from hour to hour with changing combinations of mist and cloud and light. So often in that vast blue emptiness I had sat absorbed and silent, enfolded in my thoughts and action, waiting without impatience for time to go. If now I could but gather it up again and fly through time once more: the space, the freedom, the happiness, the answer almost heard. . . .

"In the calm evening I slowly walked home through the woods. No tree stirred. I walked without consciousness. No bird sang—for the time of their rapture was gone. I looked up. In the highest zenith a contrail grew across the cloudless blue—but there was no echo in the sky. Everything was silent. The trail travelled swiftly to the far horizon, the aeroplane unseen, leaving only the slowly expanding vapour path to tell of the quietness that in the infinities of outer space awaits the quenchless, questing spirit of man."

The Fighting Services

A.D.C. to Her Majesty

AIR CHIEF MARSHAL SIR THEODORE N. McEVOY, K.C.B., C.B.E., has become Air Aide-de-Camp to Her Majesty the Queen in succession to Air Chief Marshal Sir Claude Pelly, G.B.E., K.C.B., M.C., who has retired from the Service. Air Secretary at the Air Ministry since May of this year, Air Chief Marshal Sir Theodore McEvoy was previously Chief of Staff, Allied Air Forces Central Europe.

Air Ministry Appointments

AIR COMMODORE G. T. B. CLAYTON has become Director of Operations (Air Transport and Overseas Theatres) at the Air Ministry, and Gp. Capt. J. B. Russell has been appointed Director of Operations (Maritime, Navigation and Air Traffic Control), with the acting rank of Air Commodore.

Taking up his new post earlier this month, Air Cdre. Clayton has recently been with the Plans and Policy Division of SHAPE. He took over command of R.A.F. Cottesmore in 1954 and the following year transferred to R.A.F. Honington as station commander. Gp. Capt. Russell has been C.O. of R.A.F. Luqa, Malta, since 1957, and moves to the Air Ministry on January 1, 1960.

R.N. Carrier Strength

COMMANDED by Capt. F. M. A. Torrens-Spence, D.S.O., D.S.C., A.F.C., R.N., the aircraft carrier "Albion" was recommissioned at Portsmouth on December 14. Refitted since her return to the United Kingdom last August, the carrier is due to sail for the Mediterranean early in February and work-up with Sea Venoms, Sea Hawks, Whirlwind HAS.7s and Skyraiders. Her last commission, which included a series of visits to ports in the southern hemisphere, lasted for nine months.

In addition to H.M.S. "Albion," four other R.N. carriers will be in commission at the end of this month. H.M.S. "Victorious," operating Sea Venoms, Scimitars and Skyraiders, and the "Hermes" will be at Portsmouth until the New Year. H.M.S. "Ark Royal" is due to be recommissioned on December 28 following a 14-month refit, and the "Centaur" is in the Far East and will be spending Christmas in Sydney.

The other two R.N. carriers, "Bulwark" and "Eagle," are at present undergoing refits. H.M.S. "Eagle" is due to have her modernization programme at Devonport completed by the end of January next, and "Bulwark," planned to be commissioned in the New Year, is being converted into the Commando carrier.

When the work on "Eagle" is completed, the Royal Navy will have six of its seven carriers in commission at one time. Of these, "Victorious," "Eagle," "Ark Royal" and "Hermes" will comprise the major units in operational service, with the "Albion" and "Centaur" forming part of the fleet operational reserve. After working-up in the Mediterranean, the "Ark Royal" is likely to replace the "Centaur" in the Far East.

GAN STAGING POST.—An aerial view of the R.A.F. airfield which is nearing completion on Gan in Addu Atoll at the southern end of the Maldive group. Lying in the Indian Ocean, 500 miles south-west of Ceylon, this new Transport Command staging post is on an island approximately 1½ miles long and ¾ mile wide with its single runway stretching right across from shore to shore.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Wg. Cdr. D. K. Morgan and Sqn. Ldr. V. Bridges, D.F.C., to the Department of the Air Member for Supply and Organization, the latter with the acting rank of Wg. Cdr.

Fighter Command: Wg. Cdr. C. S. West, D.F.C., to R.A.F. Boulmer to command, with acting rank of Gp. Capt.; Wg. Cdr. E. J. B. Brown, R.A.F. Regiment, to the Joint School of Nuclear and Chemical Ground Defence, for R.A.F. staff duties; Wg. Cdr. G. P. Elliott to the School of Land-Air Warfare, for directing staff duties.

Coastal Command: Wg. Cdr. A. H. G. Davis to Headquarters for N.A.T.O. administrative planning duties; Wg. Cdr. R. Los, M.B.E., to Headquarters, No. 18 Group, as Senior Technical Staff Officer.

Flying Training Command: Sqn. Ldr. J. E. Whitlock, D.F.C., to R.A.F. Thorney Island to command the Administrative Wing, with acting rank of Wg. Cdr.

Technical Training Command: Wg. Cdr. L. Baume to R.A.F., Halton as Senior Equipment Officer; Wg. Cdr. D. W. Densham to the R.A.F. Technical College, Henlow, as Chief Instructor, Electrical Wing.

R.A.F. Germany: Gp. Capt E. D. Crew, D.S.O., D.F.C., M.A., to R.A.F. Bruggen to command; Gp. Capt. W. A. Toyne, D.F.C., to R.A.F. Sylt to command; Gp. Capt. R. H. Waterhouse, C.B.E., D.F.C., A.F.C., to Headquarters as Senior Personnel Staff Officer; Wg. Cdr. D. B. Bretherton, D.F.C., to R.A.F. Uedem as Wg. Cdr. in charge of Operations; Wg. Cdr. P. G. Brodie to Headquarters as Permanent President, Courts Martial; Sqn. Ldr. J. F. C. Melrose, D.F.C., to Headquarters for German Air Force training and integration duties, with acting rank of Wg. Cdr.

Middle East Air Force: Wg. Cdr. F. W. Dewell, A.F.C. to Headquarters as Command Air Traffic Control Officer; Wg. Cdr. A. J. Potts to Headquarters for engineering duties.

Far East Air Force: Gp. Capt. V. H. Weeks to Headquarters as Principal Dental Officer; Sqn. Ldr. R. A. E. Allen, A.F.C., to Headquarters No. 224 Group, for operations and training duties, with acting rank of Wg. Cdr.

British Forces Arabian Peninsula: Wg. Cdr. L. J. Joel, D.F.C., to R.A.F., Eastleigh, Kenya, to command, with acting rank of Gp. Capt.; Wg. Cdr. R. E. B. Pinchard to Headquarters as Wg. Cdr. Civil Engineering; Sqn. Ldr. C. M. Stavert, A.F.C., to Bahrein as Senior Officer, Administration, Persian Gulf, with acting rank of Wg. Cdr.

Other Appointments: Wg. Cdr. F. R. L. Mellersh, D.F.C., to the Ministry of Defence.

More Service News

CENTO Post.—Air Vice-Marshal H. P. Fraser, C.B., C.B.E., A.F.C., is to become the United Kingdom representative on the Permanent Military Deputies Group of the Central Treaty Organisation (CENTO), with the rank of Air Marshal. To be established on January 1, 1960, this new Group will be responsible to the CENTO Military Committee.

R.A.F.A. Gliding Club.—The R.A.F. Association has formed a Gliding Club and the inaugural meeting was recently held at Podington Airfield, Bedfordshire. The chief flying instructor of the Northants Gliding Club, Mr. K. Pearson, has been elected chairman of the new club and Mr. S. Shields is the secretary. The Northants Gliding Club has offered the use of its seven gliders and other facilities to the new R.A.F.A. venture.

Before the V-bombers

by D. L. Brown, M.I.Mech.E., A.M.I.C.E., M.I.Gas.E., A.F.R.Ae.S.

FACTS relating to successful aircraft are generally well known, but too little is heard of the many ingenious ideas and designs which, for one reason or another, never see the light of day. Yet these unborn designs and projects are all part and parcel of the process of evolution which ultimately results in the development of the successful types.

Many project designs are never ordered and remain unknown. However, sometimes the cause is enemy action, as in the case of the Armstrong Whitworth B.1/35 and the Supermarine B.12/36.

The B.1/35 was a development of the Whitley, the thick wing being used to house a buried engine installation consisting of two new 21-cylinder triple-bank radials known as the Armstrong Siddeley Deerhound. After bench testing, the first two flight engines were lost in a crash on take-off due, it is believed, to pilot error. The remaining prototype engines were destroyed when the factory was bombed, and thus neither the Deerhound nor the B.1/35 ever came to fruition.

A similar fate met the prototypes of the Supermarine B.12/36 bomber—R. J. Mitchell's last design—to the same specification as the Short Stirling. This machine (Fig. 1) was designed to take either the Rolls-Royce Merlin, the Bristol Hercules or the Napier Dagger; but, under the terms of the specification, it was limited in span and therefore had low aspect ratio and high induced drag. Its span was 93 ft. and its estimated all-up weight was 55,000 lb., as compared with 99 ft. and 52,000 lb. for the Stirling as designed.

Unlike the Stirling, Halifax and Manchester, the Supermarine bomber was designed to carry large numbers of bombs in the wings as well as in the fuselage. In the light of subsequent operational experience, its estimated performance appears optimistic—the predicted maximum speed being 370 m.p.h. and the range 3,000 statute miles with 8,000 lb. of bombs. This speed is over 100 m.p.h. higher than that of the Stirling, while the range is double that of the Stirling carrying the same bomb load and at an a.u.w. of 69,000 lb.

During construction of the prototypes the factory was bombed and the B.12/36 project was abandoned in favour of increased Spitfire production.

Just before the War, one or two of the old-established firms, which had been principally concerned with smaller types of aircraft, were endeavouring to enter the field of heavy aircraft. Among these were Fairey, with an advanced design for a four-engined civil transport; and Bristol who, early in 1939, submitted a design for a four-engined bomber to Specification B.1/39.

This last-named machine, powered by four Hercules engines, was designed to have an a.u.w. of 70,000 lb. at a wing loading of 38.8 lb./sq. ft. At that date the largest bomber was the Short Stirling with an a.u.w. of 57,400 lb. Moreover, with a span of 114 ft. and an aspect ratio of 7.22, the B.1/39's rate of climb and ceiling should have been better than those of the Stirling with the same wing loading and an aspect ratio of only 6.7.

The B.1/39 design was unusual in that it did not incorporate the conventional nose and tail turrets, the armament being provided by a dorsal and a ventral turret. Possibly due to the necessity of concentrating upon the production of the Blenheim, Beaufort and Beaufighter, the Bristol B.1/39 was never built.

In 1941 Shorts submitted a design for an enlarged and improved development of the Stirling to Specification B.8/41 (Fig. 2). The shortcomings due to the limitation of span of the Stirling were eliminated and advantage was taken of the more powerful Bristol Centaurus engines then under development.

Thus, the B.8/41 was designed to have an a.u.w. of 104,000 lb.—exactly double the original design weight of the Stirling. The span was 135 ft. 9 in. and the wing area 2,145 sq. ft.—giving an aspect ratio of 8.6, compared with 6.7 in the case of the Stirling. The wing loading was 48.3 lb./sq. ft., which was just about the same as that to which the Stirling had been developed by 1941, thanks to the advent of concrete runways and the availability of the more powerful Hercules XI engine.

Despite its promise of enhanced performance, both as regards range, ceiling and bomb load, the B.8/41 was never built.

Early operational experience with the Stirling, especially at increased all-up weights and wing loadings, showed clearly the adverse effect on performance of low aspect ratio. And a further proof that this lesson had been well learnt by 1942 lay in the award to Vickers of a contract for a four-engined bomber to Specification B.3/42.

This machine, known as the Windsor, was the first and only four-engined aircraft of geodetic construction and it had an aspect ratio of 11 (Fig. 3). It was covered throughout with a specially woven steel wire and fabric composite material; and, in addition, certain parts of the aircraft had a further backing of glass cloth.

Its span was 117 ft. 2 in. and the wing area was 1,248 sq. ft. The normal loaded weight was 77,000 lb. with an overload a.u.w. of 81,362 lb., giving a wing loading of 61·65 lb./sq. ft., which was an advanced figure for that date.

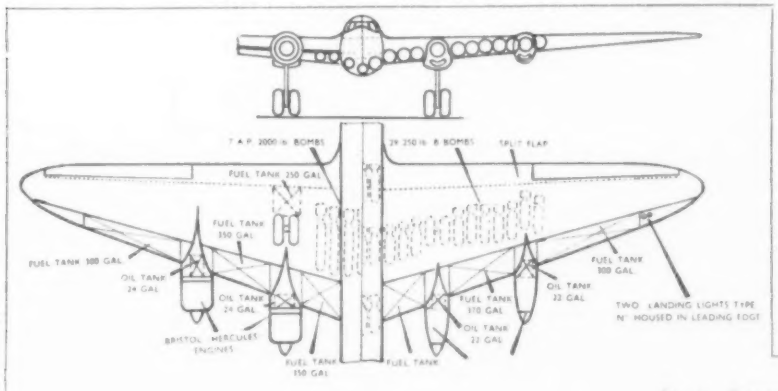
The first prototype was fitted with four Merlin 65 engines with underslung radiators; but the third prototype had Merlin 85s with the later annular radiators. The still-air range was 2,890 statute miles at 23,000 ft. with 8,000 lb. of bombs.

Rear defence was to have been by two remotely controlled turrets mounted in the rear of the inboard engine nacelles, the gunner aiming from a position in the extreme tail. The idea was tried out on a Lancaster which had turrets in the dorsal and ventral positions, controlled from the tail.

An unusual feature was the undercarriage, which was in four units, retracting into each of the engine nacelles. These must have had a high drag both after take-off, before retraction, and on the approach. Under normal conditions this would be of little consequence, but it might be embarrassing in the event of engine failure during take-off and when doing a three-engined overshoot.

Only three prototypes of the Windsor were built, of which the first crashed on a delivery flight after successful initial tests. A reason for its non-production may have been that, by the time its trials had been completed, the Lancaster was in full and increasing production and the end of the War was in sight.

During 1941, the advent of more


FUEL TANK 250 GAL
FUEL TANK 350 GAL
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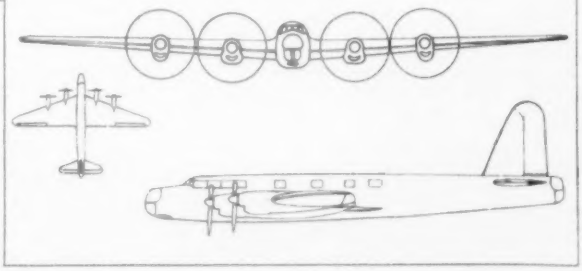
OIL TANK 24 GAL
OIL TANK 24 GAL
BRISTOL HERCULES ENGINES
FUEL TANK 150 GAL
FUEL TANK
FUEL TANK 370 GAL
OIL TANK 22 GAL
OIL TANK 22 GAL
FUEL TANK 100 GAL
TWO LANDING LIGHTS TYPE N° HOUSED IN LEADING EDGE

Fig. 1. Supermarine's B.12/36.



highly supercharged engines, such as the Merlin 60 with a greatly enhanced operational height, together with the anticipated advent of the jet engine at a later date, led to the issue of Specification B.11/41 calling for a high-speed high-altitude unarmed bomber to cruise at 350 m.p.h. at 30,000 ft. and to have a still-air range of 1,600 miles with a bomb load of 4,000 lb.

It is interesting to note that Hawkers submitted a twin-engined design to this specification, based on the use of a developed version of the Napier Sabre engine, which was expected to deliver 1,230 b.h.p. in weak mixture at 30,000 ft. The Hawker project had an a.u.w. of 33,080 lb. with a wing area of 670 sq. ft., giving a wing loading of 49.2 lb./sq. ft.

In the view of R.A.E., it would have failed to meet the requirements of the specification when carrying the prescribed bomb load—its estimated range being 1,480 statute miles at 329 m.p.h. at 20,000 ft. This led R.A.E. to investigate the problem and they came to the conclusion that, with an orthodox

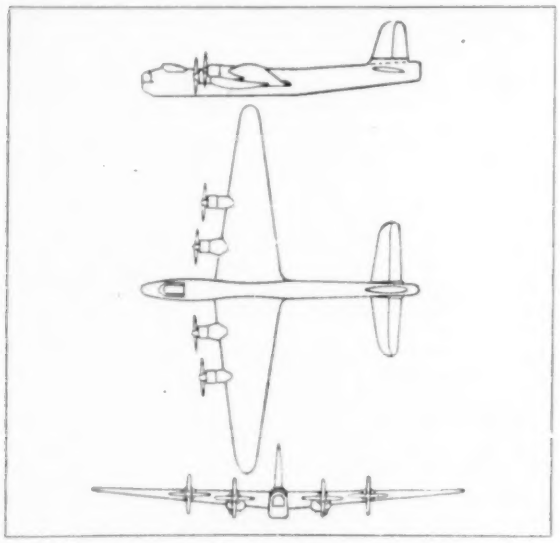


Fig. 2. Short's design to Specification B.8/41.

aeroplane, it was impossible to meet the requirements of the specification.

They considered that the best results obtainable with two Sabres could be achieved with a machine of 85-ft. span and a wing area of 630 sq. ft., giving an aspect ratio of 11.5. The estimated a.u.w. was 38,700 lb., giving a wing loading of 61.5 lb./sq. ft. Such a machine was expected to satisfy the requirements in respect of bomb load, operating height and range, but at a speed of 335 m.p.h.—15 m.p.h. lower than the specified figure.

R.A.E. then turned their attention to unorthodox layouts to see if the desired performance could be achieved. The tailless configuration was rejected on the score of the limited C_L and C.G. range attainable; but investigation of a tail-first layout seemed more promising. Moreover, it was now early in 1942 and the jet engine had proved itself and could safely be assumed as the powerplant for future designs.

The R.A.E. design envisaged a swept rear wing of 64-ft. span and 550-sq.-ft. area, together with a small front wing of 50 sq. ft. fitted with leading-edge slats and Fowler flaps (Figs. 4 and 5). The estimated a.u.w. was 30,000 lb., giving an overall wing loading of 49.2 lb./sq. ft.

Two Metropolitan-Vickers F.3 engines were buried in the rear centre section, giving a total static thrust of 4,750 lb. at sea level. Although the specification called for an unarmed bomber, provision was made for a dorsal and a ventral turret, each fitted with two cannons and remotely controlled from a position in the tail of the fuselage.

Thanks to the jet engines and when carrying the prescribed bomb load, the estimated maximum speed was 440 m.p.h. at 35,000 ft. The still-air range was 2,180 statute miles at 400 m.p.h. at 40,000 ft.

Concurrently, Miles submitted a design for a tandem-winged aircraft, known as the Libellula. This envisaged a swept rear wing of 55-ft. span and 417-sq.-ft. area, together with a straight front wing of 40-ft. span and 139-sq.-ft. area, having an aspect ratio of 11.6. The estimated weight was 26,750 lb., giving an overall wing loading of 47.3 lb./sq. ft.

Powerplant consisted of two Merlin 60 engines mounted on

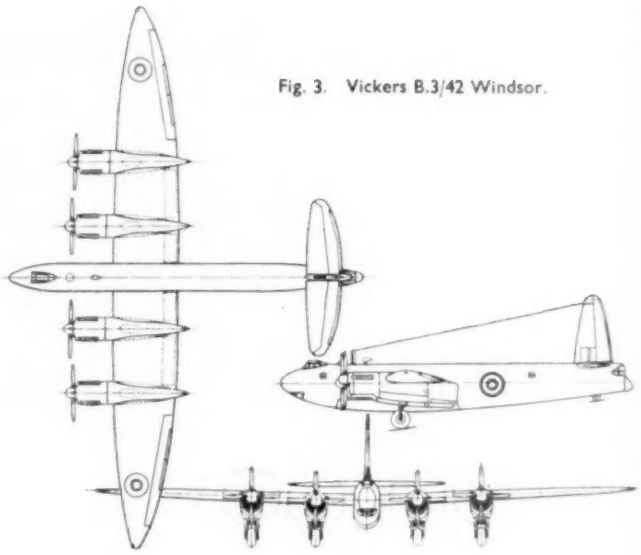


Fig. 3. Vickers B.3/42 Windsor.

the rear wing and the estimated performance was that required by the specification. Provision was made for fitting jet engines as soon as these became available. The elevators were mounted on the front wing and the ailerons on the rear wing, both wings being fitted with flaps.

Simultaneously with the submission of the project design, Miles built a scaled-down version of this machine (Fig. 6) in order to confirm the estimated performance, to ascertain the handling characteristics and to determine the permissible C.G. range. The latter, as might be expected on a tandem-wing aircraft, was far greater than is attainable with an orthodox layout.

The writer can confirm that there were no adverse handling characteristics and, thanks to the tandem-wing layout, the stall was exceptionally innocuous, as the more lightly loaded rear wing never stalled. Official trials were carried out by R.A.E. and confirmed the earlier wind tunnel results from N.P.L.

In 1944 the jet version of this project (Fig. 7) was submitted, primarily for use as a high-speed mailplane, although in almost all respects it was identical with the bomber version. The powerplant consisted of three Power Jets W.2/700 engines mounted in the tail, much in the manner which has recently become fashionable. Thanks to these engines, the estimated cruising speed was increased to 500 m.p.h. at 36,000 ft. and the weight decreased to 22,500 lb.

During 1942, presumably at the invitation of M.A.P., five of the major companies submitted preliminary project designs for bombers very much larger in size than anything attempted before in this country. Altogether, 15 designs were submitted, ranging in all-up weight from 70 to 100 tons and including both tail-first and tailless configurations, in addition to conventional layouts.

The five companies were Avro, Bristol, Handley Page, Short, and Vickers, and their respective proposals will now be briefly

(*Continued on page 665*)

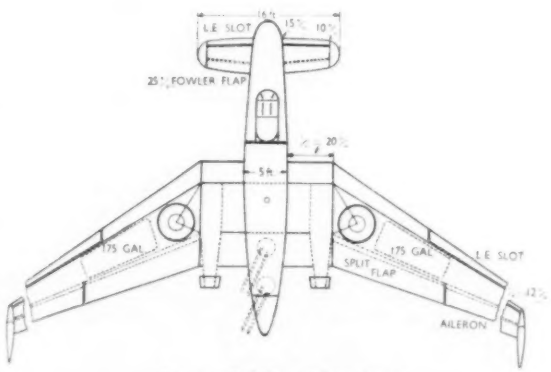


Fig. 4. R.A.E. tail-first design.

Holiday-makers view Christmas scenery from the un-Dickensian cosiness of a Dart Herald's cabin.

Handley Page
wishes you a merry Christmas
and a happy New Year

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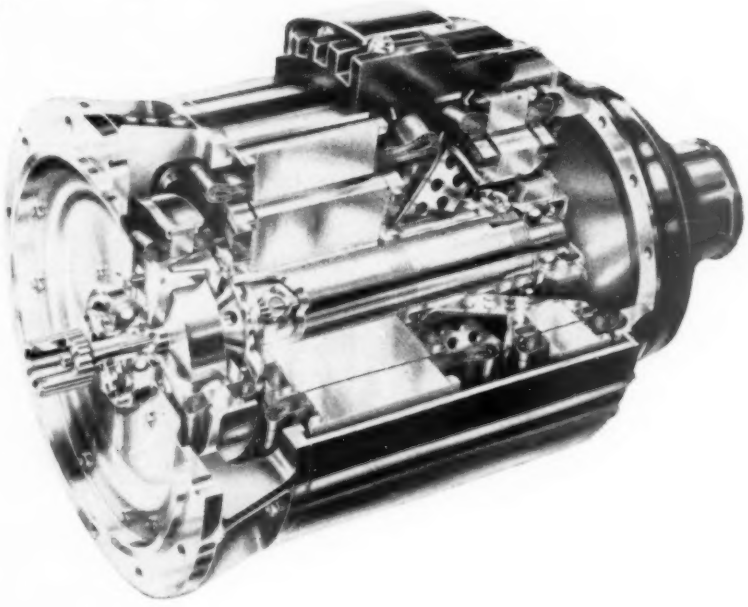

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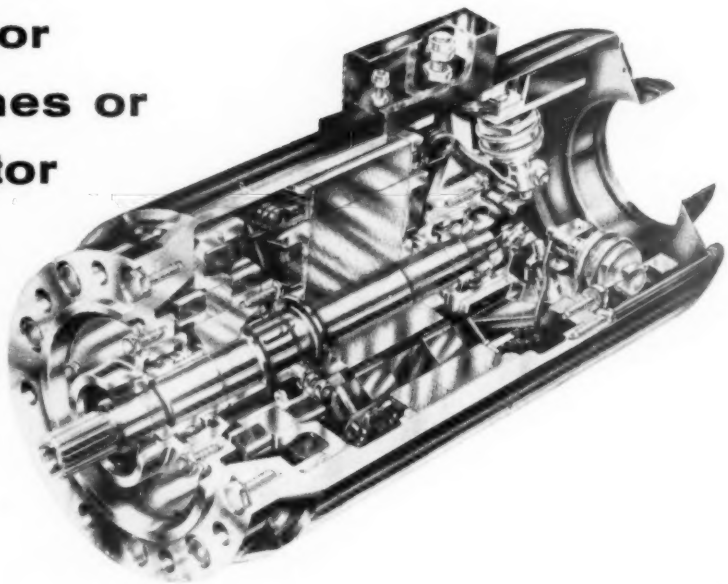

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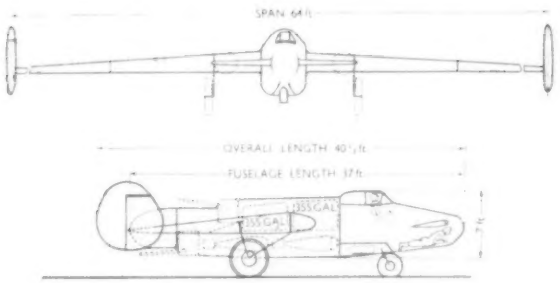


Fig. 5. R.A.E. tail-first design.

(*Continued from page 664*)

reviewed, although each is of sufficient interest to merit a separate article.

Avro submitted two conventional designs, both of high aspect ratio and designed to cruise at 300 m.p.h. at 20,000 ft. The smaller machine had an a.u.w. of 176,000 lb. and a wing loading of 60 lb./sq. ft. The aspect ratio was 11 and the powerplant consisted of eight 2,000-h.p. engines in separate nacelles driving tractor contra-props. The fuselage was 130 ft. long and 14 ft. deep. The bomb load was 19,500 lb. with 8,000 gal. of fuel.

The larger machine had a lower wing loading, a higher structure weight and a correspondingly lower disposable load. The a.u.w. was 220,000 lb. and the wing loading 45 lb./sq. ft. with an aspect ratio of 10. It was powered by ten 2,000-h.p. engines housed in separate nacelles and driving tractor contra-props. The fuselage was 152 ft. long and 17 ft. deep. The bomb load was 15,000 lb. with 11,000 gal. of fuel.

Bristol submitted two most interesting designs, both with buried engines, pusher propellers, Vee tails and stressed-skin wings with no spars (Fig. 8).

The smaller machine had a weight of 170,000 lb. and a wing loading of 46 lb./sq. ft. The aspect ratio was 8.7 and the powerplant consisted of eight Rolls-Royce Griffon 61 engines coupled in pairs and driving four pusher contra-props.

The larger machine had a weight of 220,000 lb. with a wing loading of 45 lb./sq. ft., a high-taper ratio and an aspect ratio of 9.9. It was powered by eight Bristol Centaurus 12SM engines coupled in pairs and driving four pusher contra-props. The fuel-plus-bomb load was 88,500 lb., maximum fuel being 6,800 gal. and maximum bomb load 39,600 lb. The undercarriage track was 47 ft. 6 in., which appears rather narrow for a machine with a span of 220 ft. The estimated cruising speed was 315 m.p.h. at 25,000 ft.

Handley Page submitted proposals for the three smallest of the 15 project designs. But two of these were tail-first layouts with sweepback, one of which was jet powered—the only design to be so.

All three projects had an a.u.w. of 157,000 lb. The first was a conventional layout powered by four 3,000-h.p. engines housed in separate nacelles and driving pusher propellers. These engines were an anticipated development of the Sabre. The wing loading was 60 lb./sq. ft. and the aspect ratio 11; the wing was heavily tapered. The fuel-plus-bomb load was 60,500 lb., and the estimated cruising speed was 332 m.p.h. at 30,000 ft.

The second design had the same weight, aspect ratio and powerplant, but was a tail-first configuration of rather smaller dimensions and higher performance. Thanks to the tail-first configuration, the fuselage was about half the length of those of the conventional projects, being only 67 ft. long. It was, however, 18 ft. deep with the bombs stowed in tiers.

The wing was heavily tapered and had 22½° of sweepback. The wing loading was 72 lb./sq. ft., the fuel-plus-bomb load was 69,000 lb. and the estimated cruising speed was 354 m.p.h. at 30,000 ft.

Handley Page's third design, powered by eight jet units, was also a tail-first layout with the same fuselage, a heavily tapered wing of 7.6 aspect ratio and 22½° sweepback. The wing loading was 72 lb./sq. ft. and, due to the limited thrust of the jet engines then available, provision was made for assisted take-off. The maximum bomb load was 48,000 lb. with 5,000 gal. of fuel—by far the highest percentage of a.u.w. of any of the designs submitted. The estimated cruising speed was 500 m.p.h. at 40,000 ft.

This machine was the smallest, fastest, structurally most efficient and most heavily loaded of any of the 15 designs. At the same time, it must be remembered that, as in all cases, the figures quoted are only estimates and, in addition, it was the only design needing assisted take-off.

Short submitted three variants of one design—an orthodox layout powered by six engines housed in separate nacelles and driving tractor propellers. The weights were between 170,000 lb. and 180,000 lb., giving a wing loading of 51-54 lb./sq. ft. The aspect ratio was 8.5 and the three types of engine envisaged were the Centaurus, Sabre and Orion. The bomb load was 25,500 lb. with 3,300 gal. of fuel and the estimated cruising speed was 302-329 m.p.h. at 25,000 ft.

The machine was generally similar in size and power to the design which the firm submitted the following year to the Brabazon I specification. The undercarriage, which retracted into the inboard of the six nacelles, had a track of 30 ft. 6 in., which appears rather narrow for a machine with a span of 168 ft.

Lastly, we come to Vickers, who submitted no less than five project designs, two conventional, two tail-first and one tailless—all of geodetic construction and all powered by six turbo-supercharged Centaurus engines. The two conventional layouts were both of 168,000 lb. a.u.w. and had a wing loading of 58 lb./sq. ft. The engines were housed in separate nacelles.

One machine was a tractor with an aspect ratio of 12.5 and the other a pusher with an aspect ratio of 15. The fuel and bomb load was 65,000 lb. and the estimated cruising speed was 317 m.p.h. at 20,000 ft.

Fig. 6. The Miles Libellula flying scale model.

The undercarriages of these two machines call for comment. The tractor machine had six single-wheel main undercarriage units with an overall track of 88 ft. 6 in. The pusher aircraft had four main units, each of six wheels—24 wheels in all without counting the tail-wheel.

Next come the two tail-first layouts, both with an a.u.w. of 178,000 lb.; an aspect ratio of 15 and a wing loading of

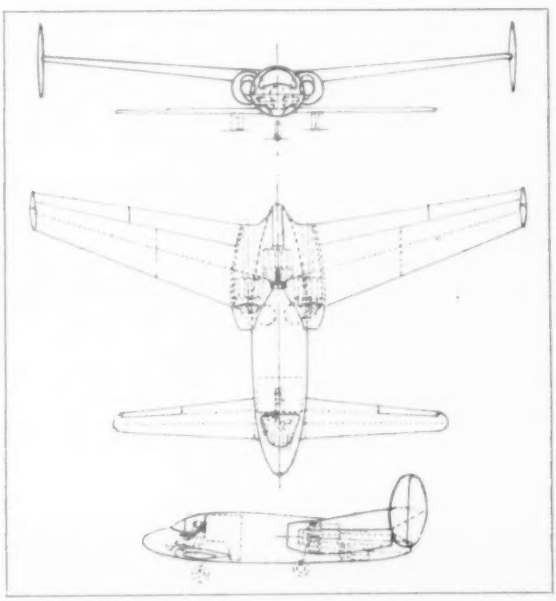


Fig. 7. Miles tail-first project of 1944.

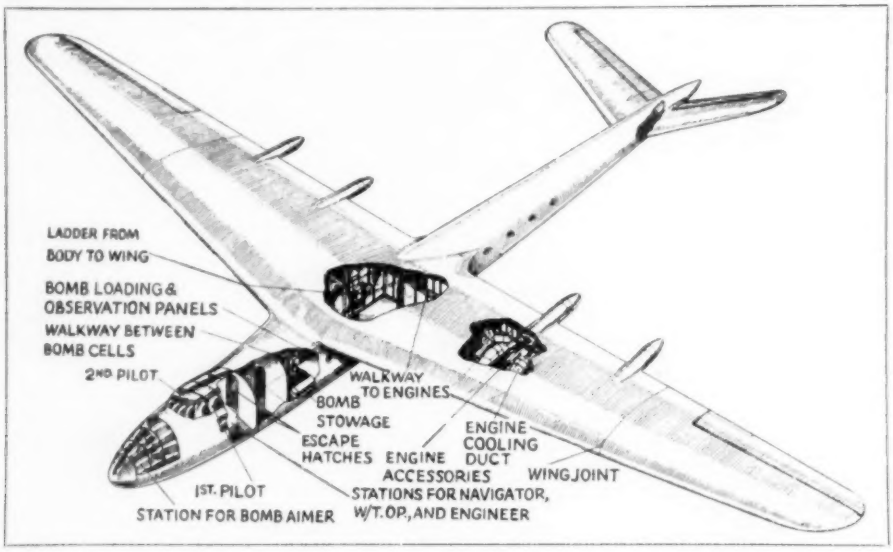


Fig. 8. Bristol bomber design to meet a 1942 specification.

62 lb./sq. ft.; a cruising speed of 317 m.p.h. at 20,000 ft.; and a fuel-and-bomb load of 55,000 lb. One machine was a tractor with the engines housed in separate nacelles, had an unswept wing and a main undercarriage of six single-wheel units. The other machine was a pusher, each inboard nacelle housing two engines and each outboard nacelle one engine. The wing was slightly swept and the undercarriage consisted of four main units, each of six wheels.

Finally, we come to the tailless layout. In this the engines were buried and drove six pusher propellers. The a.u.w. was 174,000 lb. and the wing loading 43.5 lb./sq. ft. The aspect ratio was 7.4 and the wing had 15° of sweepback. The fuel-and-bomb load was 65,000 lb.; and the estimated cruising speed was 330 m.p.h. at 20,000 ft.

Although none of these 15 projects was ever built, they represent probably the most ambitious and interesting collection of design studies ever attempted up to that date by the British Aircraft Industry (Fig. 9). The number of design man-hours involved must have been prodigious.

The first new bomber to go into production after the War was the Canberra. The first design studies for this aircraft, then known as the English Electric A.1, started in 1944, when it was intended for the rôle of fighter-bomber powered by a single projected two-stage centrifugal jet engine by Rolls-Royce giving a sea-level static thrust of 12,000 lb. and having a diameter of 66 in. This in itself was a bold concept—to envisage an aeroplane of around 40,000 lb. a.u.w. powered by a single jet engine.

After investigation of a layout involving a 30° swept wing, the Canberra design, roughly as we know it today, emerged the following year and was later ordered to the requirements of Specification B.3/45. The change from the single- to the twin-engined layout enabled the bomb load to be increased from 6,000 lb. to 8,000 lb.

To accommodate the Rolls-Royce A.J.65 engine, later known as the Avon, and to reduce the thickness/chord ratio as much as possible, the root chord is 19 ft. which, for a wing of only 64-ft. span, is exceptional. The aspect ratio is 4.26.

The following year Short received an order for a four-engined bomber, straight winged and powered by Avon turbojets, to Specification B.14/46. Thus, only five years after the first flight of the Whittle-engined Gloster E.28/39 with its 860 lb. of thrust, a bomber of 26,000-lb. thrust was envisaged—an illustration of the rapid development of the gas turbine.

The Short Sperrin had an a.u.w. of 115,000 lb., slightly more than that of their B.8/41 of five years earlier. The wing loading was 60.6 lb./sq. ft. and the aspect ratio 6.27. Cruising speed was 500 m.p.h. at 40,000 ft. and the range was 3,850 miles with a bomb load of 10,000 lb. The bomb bay was 30 ft. long and had a capacity of 996 cu. ft.; maximum bomb load was 20,000 lb.

It has been said that the Sperrin was ordered as an "insurance" against the possible failure of the more advanced types of swept-wing bomber then envisaged. In the event, these proved extremely successful and thus only two prototypes of the Sperrin were, in fact, built.

Finally, early in 1947, Specification B.35/46 was issued calling for a medium-range unarmed bomber. It is reasonable to assume that the range and bomb load would have been of the same order as that of the Sperrin. The specification was issued to certain selected firms and from it were developed the three types of V bomber as we know them today.

It has been said that a weight limitation was prescribed by the specification, much as a limitation on span was included 10 years earlier in the B.12/36 Specification. This was presumably on account of the desire to use existing runways and, like its earlier counterpart, this limitation had a marked effect upon the resultant aircraft. One manufacturer has said that the estimated weight of their first project design exceeded the prescribed figure by 100%; and that even their second attempt, a tailless aircraft rather on the lines of certain contemporary Northrop machines, was still 50% overweight.

As the weight of the Vickers Valiant, the first British nuclear bomber to go into production, has been quoted as being between 120,000 and 150,000 lb., we may assume that the weight limitation imposed was probably of the order of 100,000 lb. The range of the Valiant on internal tankage has been given as 2,980 miles and, since this is markedly less than that of the Sperrin, it may well have been one effect of the weight limitation.

At all events, the requirements of the specification when issued must have been equal to, and probably substantially in advance of, those of any other country. And, whether or not its requirements were fully met in every respect, the result has been that we now possess in substantial numbers three extremely successful and effective types of bomber.

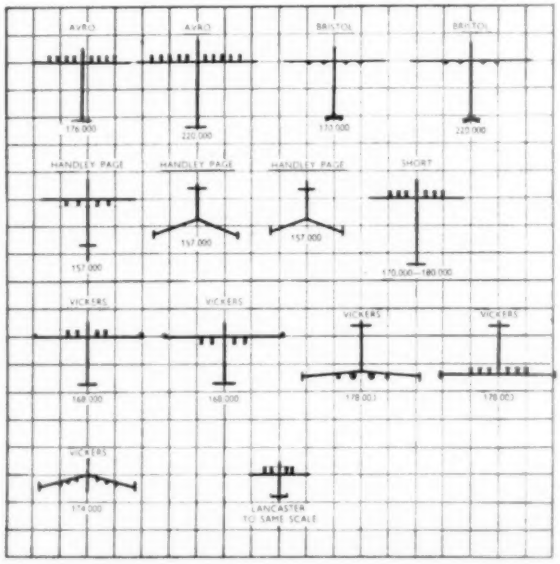


Fig. 9. British bomber project configurations.

The Meteorological Satellite

KENNETH W. GATLAND *reviews some more "practical" outlets for astronautical development*

ONE of the big hopes for artificial satellites is that, one day, they will provide a comprehensive weather information service on a global scale.

At the present time, according to Dr. Harry Wexler of the United States Weather Bureau, less than one-fifth of the total atmospheric mass is adequately probed by conventional methods and large storms could last for days undetected in desert, polar and oceanic regions. A proper distribution of satellites, on the other hand, would permit direct observation of the Earth's changing cloud cover, and it should be possible to pin-point storm centres wherever they occur.

Thus, satellite observation of the Earth's weather—as though by a periscope pushed up through the atmosphere—may be expected to revolutionize many aspects of meteorology.

Radiation Studies

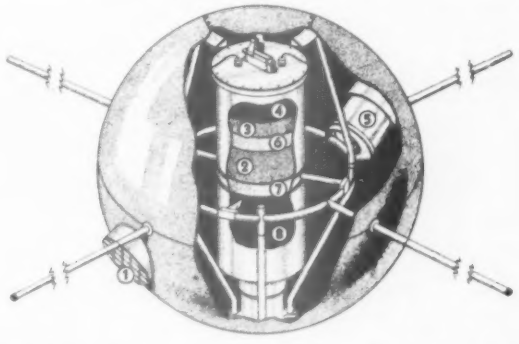
The part that radiation plays in the grand cycle of weather distribution, which carries water from ocean to the atmosphere, to land and back to ocean, is already being explored by satellites. The Earth receives more energy from the Sun near the equator than it radiates into space. And it radiates more energy into space from the poles than it receives from the Sun. This energy must be transferred from the lower latitudes to the higher latitudes by means of ocean currents and the atmosphere.

This transfer is being studied with satellites by measuring (a) direct radiation from the Sun; (b) the fraction of this radiation diffusely reflected by the Earth; and (c) the fraction of radiation which is converted into heat by the Earth and, ultimately, is reradiated back into space in the far infra-red portion of the spectrum.

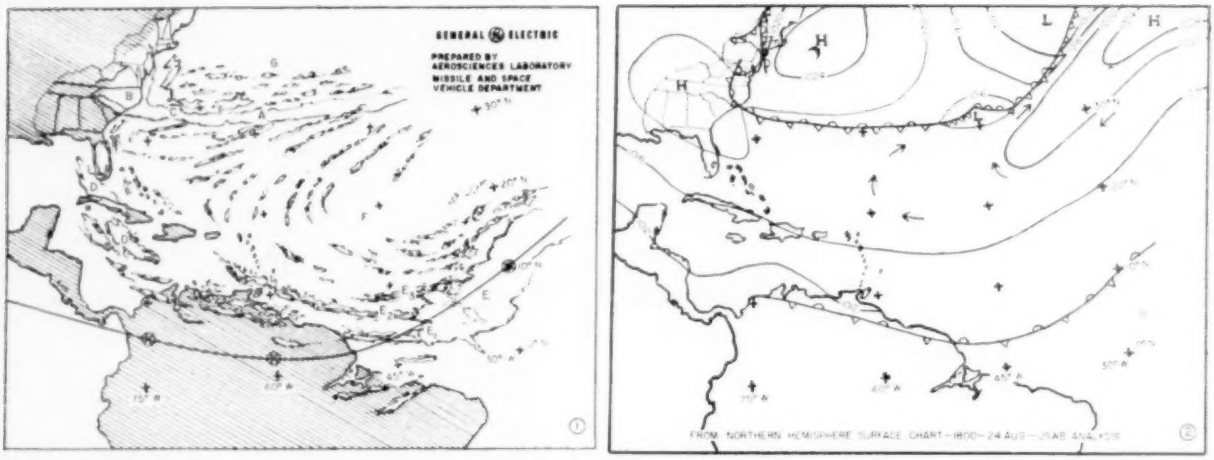
Early experiments to investigate these properties were attempted with Vanguard satellites. Instrumentation in Vanguard II, for example, consisted of two photocells designed to measure the sunlight reflected from the Earth, primarily in the infra-red range, a tape-recorder to "store" the information and a Minitrack transmitter to relay 50 min. of data within 60 sec. when commanded by a ground station.

Resolution of the photocells used in this experiment was such that they would record the average reflected light from a circle 7 miles in diameter when pointed directly at the Earth. The satellite was spin stabilized, the two photocells being mounted on opposite sides of the 20-in. dia. sphere at 45° to the rotational axis so that they swept out a path seven miles wide and 600 miles long. As the satellite circled the Earth, the photocells were to measure the varying intensities of sunlight reflected from clouds (about 80%), land masses (15-20%), and sea areas (5%). The satellite's spin, about 50 r.p.m., would cause the photocells to scan the Earth in

At an altitude of 200 miles, the main stage of Atlas can be seen falling away, having just separated from the nose-cone which carries the camera. The Earth's horizon is reflected on the polished stainless steel of the missile's body. Florida, the place of departure, can be seen (centre left) pointing towards the missile.



Left, the U.S. Navy's Vanguard "cloud-cover" satellite in place on the launching vehicle at Cape Canaveral. The 20-in. dia. satellite weighed only 21.5 lb. The sectional diagram above shows the principal components: (1) Photocell light shield; (2) Recorder; (3) Command radio receiver; (4) Meteorological data transmitter; (5) Photocell; (6) Data electronics; (7) Tracking transmitter; and (8) Mercury batteries.



Two kinds of weather chart (1), a "space-age" map based on photographs obtained from an Atlas G.E. nose-cone—showing cloud distribution—and (2), a conventional chart produced the same day by the U.S. Weather Bureau. Important information was omitted from the latter in the Equatorial region.

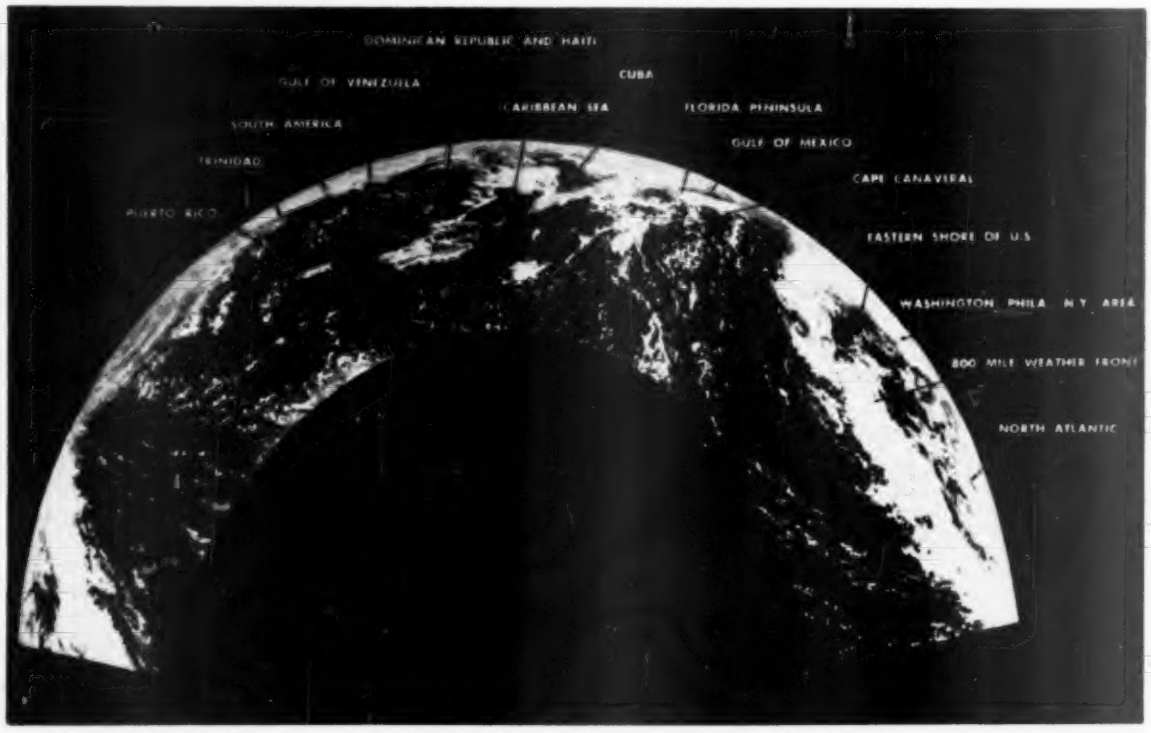
successive lines, producing a lined picture not unlike that obtained in television but, of course, lacking in definition.

The Vanguard II experiment was designed to obtain cloud-cover data between the Equator and 35° to 40° north latitude. (Although the satellite's orbit covered an equivalent area south of the Equator, most of this region was in darkness during the periods when the satellite traversed it.) According to the original plan, cloud-cover data was to be obtained for 600-mile strips on each pass, totalling 25% of the Earth's sunlit surface in a 24-hr. period.

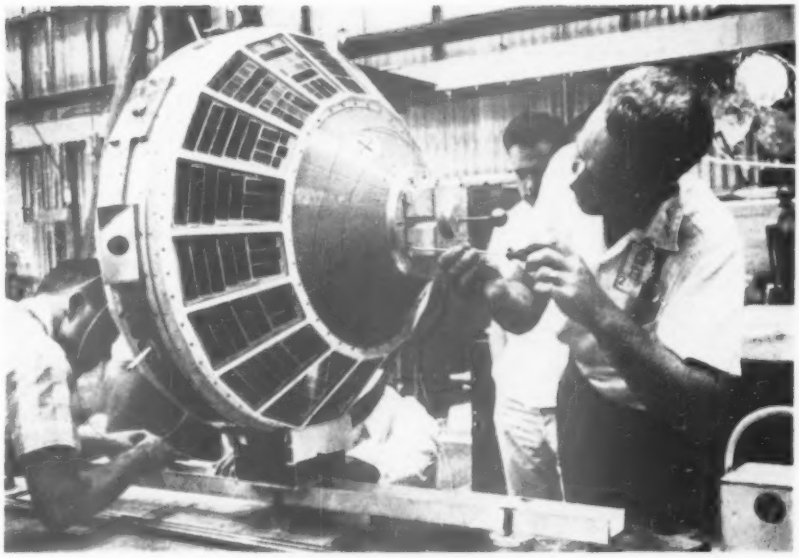
Despite the fact that Vanguard II successfully entered orbit on February 17, 1959, interpretation of the data proved impossible because of an oscillation which developed in the satellite throwing the sweep of the photocells out of true. A repeat experiment of the same basic system was frustrated on June 22 because of a second-stage failure of the Vanguard launching vehicle.

However, on August 7, Explorer VI was successfully launched into orbit including in its payload apparatus concerned with "radiation and heat balance." On the rim of the satellite, shaped like a humming-top, were six sensing elements —two small hemispheres painted black to measure total energy at all wavelengths; two hemispheres painted white to measure radiation in the longer wavelengths while reflecting short wavelengths; and two sensing elements which had a special coating making them absorption-sensitive to short-wave radiation only.

On October 13, a similar experiment was made, this time



This remarkable picture, covering a vast area of the Atlantic, and showing parts of South America and the United States, is in fact a mosaic of photographs obtained with a camera mounted in the nose-cone of an Atlas ICBM, launched from Cape Canaveral, and subsequently recovered from the sea. It gives a foretaste of the kind of picture that may be obtained from weather satellites of the future, employing television.



Final preparations being made on the U.S. Army's Explorer VII, successfully launched into orbit on October 13. Note the black and white radiation sensors on the satellite's outer rim and the strips of solar cells on the cone which generate electricity from sunlight to power the instruments and radio transmitters.

with another heavily instrumented satellite, the Explorer VII. Measurements included the transfer of radiated energy from the Earth's lower latitudes to the higher latitudes.

TV Observation

Another aspect of the experiments being supported in the United States concerns the use of miniature television cameras in satellites. Next year, the first launching is expected of the Tiros meteorological satellite, an ARPA-U.S. Navy project for which the Radio Corporation of America and the Army Signal Corps are prime contractors. The intention here is to obtain direct TV pictures of the Earth's cloud cover from a nominal 300-mile orbit.

Tiros will carry three TV cameras developed by R.C.A. One will have a field of view of about 1,000 sq. miles and a resolution of about 2½ miles, with the other two cameras having smaller fields of view but better resolution.

There will be no control system to affect the satellite's attitude once in orbit, but it will operate at a low rate of spin—about 10 r.p.m. Electrical energy is being supplied by a solar battery.

A cut-off device will prevent the cameras from operating when a large percentage of the Earth is out of sight because of the satellite's attitude or insufficient illumination. In addition to the three cameras, Tiros will carry five radiation sensors developed by the Army Signal Corps for measuring the net intake and output of radiation upon which, as we have seen, the distribution of weather depends.

An indication of what these techniques may mean in full development can be gauged from the photographs reproduced on these pages, obtained by means of a conventional ciné camera fitted in the nose cone of an Atlas ICBM. The pictures were taken at altitudes ranging from 200 to 700 miles, and geographical features can be clearly seen. The most significant part of the photographs, however, concerns the distribution of clouds, and a mosaic produced of the individual pictures has enabled weather experts to synthesize a number of large-scale meteorological features which occurred in mid-Atlantic on the day of the launching—August 24, 1959.

Here it is interesting to compare a chart based on this mosaic with a conventional weather chart prepared by the U.S. Weather Bureau, based on conditions just three hours after the Atlas pictures were taken. Both methods reveal, as one would expect, the same general weather conditions, but the conventional chart suffers important omissions, principally in the significant equatorial regions.

One clear advantage of the photograph-based chart is that the region of storm systems (usually indicated on conventional charts with thin lines to denote frontal systems) can be easily identified. The cloud formations, for example, are seen to follow "lanes" which generally lie parallel to the direction of air motion, thus helping the meteorologist to determine wind direction.

According to Mr. D. N. Vachon, one of the scientists who prepared the "space-age" chart for General Electric—the company which developed the nose-cone carrying the camera—"The weather satellites of the future will be capable of presenting us with a global picture of these cloud formations, but additional 'tools' may be needed for the precise weather maps we will need; for example, the exact location of rainfall within the cloud formations may be predicted by using radar in a weather satellite."

In Geneva on November 15, the prospects of artificial satellites in meteorology were discussed by a panel of international experts under the chairmanship of Dr. D. G. Robinson of the U.K. Meteorological Office. Their recommendations were that the World Meteorological Organization should encourage the international exchange of information obtained from satellites and that, in particular, urgent attention should be given to the most effective method of disseminating storm warnings.

The most immediate value of artificial satellites in this context, the panel thought, was measurement of cloud cover and of solar and terrestrial radiation components. In the future, it might be possible to extend these observations to include "global precipitation patterns, thunderstorm distribution, and vertical distribution of water vapour, ozone and carbon dioxide."

Tiny circuit elements of the Vanguard cloud-cover satellite being assembled at the U.S. Army Research and Development Laboratory. Printed wiring, transistors, and sub-miniature parts are used to save weight and space. Some of the work requires magnifying glasses and microscopes.

Personal Flying

A recent announcement by the American F.A.A. confirmed that private pilots will be required to have dual instruction in the basic control of aircraft by the use of instruments and demonstrate "emergency manual capability" in attitude control simulating the loss of visual reference during flight. In addition, both commercial and private pilots must be familiar with and demonstrate the use of radio for communications and navigation in cross-country flying.

This requirement does not affect the issue of instrument ratings, nor does it convey instrument flying privileges. It is merely intended to raise the general standard of proficiency, and does not meet the basic problem of a simplified instrument rating standard for private pilots.

The need for this is indicated by F.A.A. accident statistics which give prominence to the requirement for better pilot proficiency. During 1958, private pilots were involved in a total of 272 major accidents in which 345 pilots and passengers were killed and 153 seriously injured. Of these accidents, 120 or 44% resulted from inability to cope with emergencies which developed primarily en route. A total of 125 or 46% resulted from fundamental weaknesses in pilot judgment or technique.

In general aviation (non-scheduled operators) no fewer than 4,135 accidents occurred last year, involving the destruction of 741 aircraft, and substantial damage to more than 3,000.

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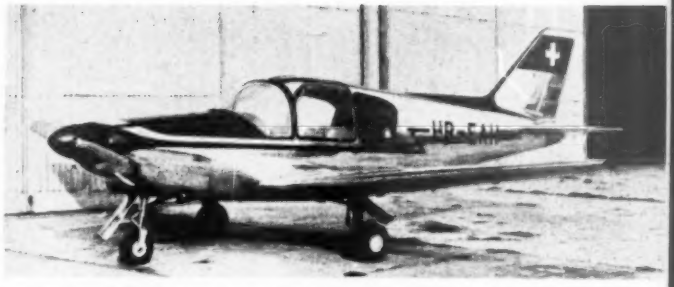
Since the arrival of the first Italian Falco in this country, it has attracted a great deal of attention, and a second, G-APXD, has now appeared on the British Register. The design has since been further developed by Ing. Stelio Frati, into the F-15 Picchio, which is being produced in Milan by Procaer, with an initial batch of six aircraft.

The Picchio resembles the F-14 Nibbio in being powered by a 180 b.h.p. Lycoming 0-360-A1A engine, and is also capable of carrying either three or four persons. For the smaller capacity, a 160 b.h.p. Lycoming may be fitted. Like the Nibbio and Falco, it is of all-wood construction, but the ply skin has a covering of aluminium. Leading particulars are: span, 30.5 ft.; length, 24.6 ft.; height, 9.23 ft.; useful load, 981 lb.; gross weight, 2,425 lb.; maximum speed, 186.5 m.p.h.; cruising speed, 168 m.p.h.; landing speed, 53 m.p.h.; take-off run, 722 ft.; landing run, 590 ft.; service ceiling, 17,050 ft.; range, 775 miles, endurance, 5 hours.



FRATI'S FIFTEENTH.—Latest design by Ing. Stelio Frati is the F-15 Picchio 3/4-seater, seen here in Swiss markings.

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Latest news from the clubs includes the following:—

● Exeter Aero Club has been reluctantly compelled to increase the basic rates for dual and solo in its Austers and Tiger Moths by 5s. an hour as from December 1. At £3 12s. 6d. these are still among the lowest in the country. After the glorious summer, the weather deteriorated in October, but the total hours flown for that month still amounted to 122.

● At Fair Oaks, first solos were successfully completed by B. J. McDonald and J. W. Davies, while P.P.L.s have been obtained by J. Bartholomew and K. Grundy.

● The Lancashire Aero Club managed to do slightly more flying in November this year than last—57 hours compared with 46—bringing the six-monthly total to 1,082. This compares with 905 for 1958.

Gliding Notes

by Dr. A. E. Slater

ONCE again the British Gliding Association asks for claims to be sent in, before December 31, for this year's annual awards and trophies, given for the best British performances in various categories during the year.

Twelve new British National and/or United Kingdom records have been homologated, eight of them for women. Mrs. Anne Burns put up seven of both kinds: 100-km. triangle, first at 27.1 m.p.h. and later beating this with 37.3 m.p.h.; 200-km. triangle at 25.6 m.p.h.; 200 km. straight-line at 42.3 m.p.h.; 282 miles distance; 16,750 ft. height gain, and 18,400 ft. absolute altitude. Mrs. Ann Welch has the women's national goal-flight record with 221 miles, flown in France in August.

Cdr. Nicholas Goodhart's new records are National distance and National and U.K. goal-flight, 360 miles; and U.K. speed record over a 500-km. straight line, 56.4 m.p.h. Lieut. Cdr. Tony Goodhart has National distance, 384 miles, flown in France.

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WHEN shower clouds develop a fibrous appearance at the top, rain usually begins to fall from the bottom. But, according to P. M. Saunders, who writes in the *Meteorological Magazine*, this is not necessarily a sign that the water droplets have been replaced by ice crystals at the cloud top; it only means that the particles, whether of ice or water, have become too large to evaporate quickly.

Mr. Saunders gives a relationship between the average strength of thermals in the cloud and the depth of cloud needed to produce a shower. With thermals rising at 6½ ft./sec. a shower is "released" when the cloud is 7,500 ft. thick; but with cloud thermals of 23 ft./sec., the cloud must be 17,000 ft. thick before the shower begins. The stronger the thermals, the taller a cu-nim must grow before it rains.

These figures are for a cloud base temperature of 50° F. In winter months, if the cloud base is at freezing point, the cloud has to be about 20% thicker to produce a shower.

Sometimes, Mr. Saunders says, light showers fall from a strato-cumulus sheet in the early evening after the cumulus clouds have "toiled in vain all day" to produce showers, and he says the strato-cumulus forms independently of the cumulus. This is the first time I have seen a meteorologist make the latter statement. For at least 50 years meteorological text-books have been saying that cumulus clouds "flatten out" in the evening to become patches of strato-cumulus. You have only to watch them to see that they do nothing of the sort. The cumulus clouds evaporate as cumulus, and the flat patches are formed anew, as flat clouds, from the last thermals of the day.

• • •

FOR the first time in its history, the London Gliding Club is going to exceed 3,000 hours' flying this year. It had already attained this figure by the end of October, and the total reached 3,130 hours at the end of November.

The high-performance section of the club fleet is now being used to such advantage that new rules for promotion on to it have had to be formulated, in order to ensure that these machines shall be only flown by pilots who know how to make full use of their modern capabilities. So it will no longer be sufficient to have done a specified number of hours and shown that you are a safe pilot.

Before you can fly the Sky, you must have done a 100-km. out-and-return or triangle, and to get on to the Skylark 3 you must do both. But a completed Gold "C" gets you on to either machine.

These new rules should encourage people to do more cross-countries, particularly those which need no retrieve, and will also ensure that the best machines will be reserved for those who want to make full use of them rather than be wasted on "merely" local soaring. This is a far cry from the early days when the problem was to get the club fleet to soar at all.

The London Club announces 27 instruction courses at Dunstable, open to non-members, next year between April and October inclusive.

Another club to announce next year's courses is the Midland, which is holding 20 courses at Long Mynd, Church Stretton, between March 21 and September 30.

• • •

A GLIDING club for the Royal Air Forces Association has just been formed at a meeting held at Podington Airfield, Beds, where the Northamptonshire Gliding Club has been operating this year. The secretary is Mr. S. Shields, who is secretary of the Eastern Area of the R.A.F.A.

Correspondence

"Southern Cross" and the Antipodean Airmail

THE information required by Mr. Wotherspoon in his recent letter to you ("Historical Facts Wanted," December 11) is as follows:—

The intended Jubilee Airmail flight from Australia to New Zealand by Kingsford-Smith and his crew in 1935 was unsuccessful. He took off at 12.20 a.m. on May 15, from Richmond Aerodrome, near Sydney, in his three-engined (Wright Whirlwinds) Fokker monoplane "Southern Cross" and set course for New Plymouth on North Island.

At 7 a.m., when about 500 miles out, the port propeller was damaged as the result of a piece of exhaust-pipe from the centre engine breaking off and splintering a blade.

Not having reached the point of no return "Smithy" turned back for Sydney on two engines and dumped the major part of the mail in order to lighten his load. After several worrying hours the machine staggered into Mascot Aerodrome at 4 p.m. with the remaining seven mail-bags.

This was the last flight of "Southern Cross" before being handed over to the Commonwealth Government for preservation. Sir Charles Kingsford-Smith's biography, "My Flying Life," tells the story of his many record-breaking flights.

Hounslow, Middx. H. F. COWLEY.

Specialist Navigation Association

THANK you for publishing the notice about the Specialist Navigation Association in your issue of December 4. Your wording gives the impression that membership will only be open to graduates of the Course since it has been at Manby. This is not so; membership is to be open to all graduates since the inception of the Specialist Navigation Course.

As you know, a Specialist Navigation Course in various guises has been in existence in the Royal Air Force since 1919, starting off at the School of Air Pilotage at Andover, and has subsequently been located at Calshot, Manston, St. Athan (whence it moved at the outbreak of war), Cranage, Port Albert (Canada), Shawbury, and finally in 1952 at the Royal Air Force Flying College at Manby.

R.A.F. Manby. WG. CDR. H. L. LEWIS.

Corporation Problems

THE situation has been, or shortly will be, reached whereby a Corporation First Officer's starting salary is several hundred pounds more a year than that of a Captain working for the Independents.

Apart from the obvious moral wrong of this situation, is it not time that some sympathy was felt for the Corporations who, having to shoulder this not inconsiderable extra financial burden, have to face sneers of not being able to make a profit?

Surely, in any other industry this would be called unfair competition and would not be tolerated?

Westcliff-on-Sea, Essex. D. MEAKEN.

Save One Sunderland!

WITH reference to my letter published on August 21, I am launching a campaign, the object of which is to obtain and preserve a Sunderland in good condition. Your readers will appreciate better than most people what we owe to this wonderful aircraft. If one can be permanently beached in Britain, she will be a lasting memorial to the work of her gallant crews and lasting evidence of the excellence of British flying-boat design and construction. More than that, on view to the public, she will be a source of revenue to Service charities, as well as paying for her upkeep.

The only Sunderlands left are with the Royal New Zealand Air Force. When their service is brought to an end, with the help and co-operation of the New Zealand Government one could be flown back to Britain and beached somewhere. If brought to Pembroke Dock, a team of helpers will be ready to look after her, when she will have been brought ashore. Doubtless, there will be such willing enthusiasts in other parts of the country.

Cost of the flight home is put at about £15,000, when all aspects of staging, etc., are considered. I have had expert advice on this. The amount, upon consideration, represents one pound each from the population of a fairly small British town. When we consider the numbers of people all over Britain with special reasons for remembering the Sunderland—those who built her, flew her, serviced her, lived near her bases and, on board ship, sailed under her protection, the figure can be more optimistically viewed. Add to these the countless numbers with no direct connection but who had great affection for the grand old aircraft and, if only a proportion sent in contributions, the amount per individual would be very small indeed.

I appeal for letters and cards, promising support, and if the response to this *last chance* to save a Sunderland is sufficient, a fund can be set up and contributions sent in.

Pantgwyn, Cardigan. PETER THOMAS.

Wroundabout

Greetings. A happy Christmas and a carefree New Year to all friends of Wren, especially to those who spread this sort of good humour:

"I cannot resist suggesting that the Eagle Airways passenger who caused the diversion to Rome" (to have her baby delivered by Eagle, not stork—*Wroundabout, 13.11.59*) "must have felt an eyrie sensation."—*Gp. Capt. E.M.T.H., Bucks.*

"I enclose Italian NOTAM Class II No. 330/59, referring to helicopter landing area markings. Note the passage 'This area will be delimited by white coloured cones or tetrahedrons and will have in its centre the letter H iscripted in a hatchured equilateral triangul as shown in the attached drowning.' A good thing that helicopters can't read! (A shame to poke fun at poor people stumbling over another language.)"—*J. Van H., Holland.* And from a Dutchman writing English, that's a seasonably charitable thought.

"A nice remark by one of our sales people when told that Lockheeds on Electra displays were giving away gold cuff links—'That's no good to us—most of our customers haven't even got shirts'."—*C.G., Weybridge, Surrey.*

"You're slipping—haven't you noticed that English Electric have not denied that Johnny Squier is the first man to solve the re-entry problem?"—*T.C., Crawley, Sussex.*

*

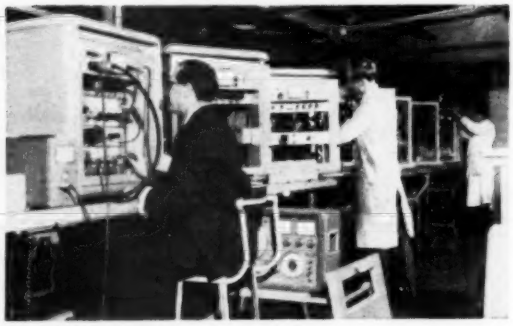
In Qantas House, Sydney, there is in the booking hall a huge model of a 707 with one side of the fuselage covered with transparent plastic to reveal the interior. After examining this, a woman (no man would be so stupid, of course) is said to have booked a World trip on condition that she got a seat on the glass side.

*

Aussie Metric. I bring back good news for Oliver Stewart. Australia and New Guinea are going metric. The schools, especially in New Guinea, are swinging over to the common-sense system, and the coinage is scheduled for change, if you get me. The word will spread. Be wise—metricise!

by Wren

NOTES AND EVENTS



GROUND-TO-AIR.—Radio equipment being manufactured at the Telecommunications Division of Elliott Brothers (London), Ltd. This VB200IA ground-to-air radio installation has been ordered by the Portuguese Air Force.

SIMULATORS FOR THE NAVY.—Miles Electronics, Ltd., recently delivered to the Royal Navy an operational flight simulator for the de Havilland Sea Vixen FAW.1. The co-operation of Ultra Electric, Ltd., was obtained in connection with the radar simulation systems. Miles Electronics, Ltd., has also been awarded the contract for a simulator for the Blackburn N.A.39 low-level strike fighter for the Royal Navy.

IRISH AIR LINES CONTRACT.—Irish Air Lines, Dublin, has selected the flight data recorder of Waste King Corporation, Los Angeles, to aid in maintenance procedures for its new Boeing 707s. This order brings the company's sales backlog in flight data recorders to more than $1¼ million. Other airlines which have purchased the instrument are United Air Lines, Eastern Air Lines, Northwest Orient Airlines, S.A.S. and Swissair.

LOW TEMPERATURE GREASE.—Ministry of Aviation approval has been given to Molysil 33, the molybdenized silicone grease manufactured by Rocol, Ltd. The grease will lubricate efficiently down to temperatures of −90° F., which property makes it particularly useful for aircraft use. By use of Molysil 33 for the lubrication of the auto-pilot, aileron, rudder, elevator and elevator trim servo-motors and mountings, in its Britannia aircraft, Bristol Aircraft, Ltd., has increased the relubrication period of these units by five and six times, according to the unit. Formerly it was necessary to remove these units from the aircraft for relubrication every 500 hr.; now they may remain installed for the duration of their overhaul life of 3,000 or 3,600 hr.

DAGENITE IN MEXICO.—The three de Havilland Comet 4Cs which have been ordered by Cia. Mexicana De Aviacion, an affiliate of Pan American World Airways, will be fitted with Dagenite aircraft batteries, type 12 ECM13-VA, manufactured by Pritchett and Gold and E.P.S. Co., Ltd., 137 Victoria Street, S.W.1. The 24-volt batteries have a capacity of 17 a.h. at the one hour rate; they weigh 42 lb. filled and are of the same design as those used in the Comet 4B.

JETHETE STEELS.—For some years, the research and development department of The United Steel Companies, Ltd., has been working in collaboration with Samuel Fox and Co., Ltd., in the development of a range of high strength stainless steels for elevated temperature service. This work has led to the introduction of the Jethete series of steels. Two of the steels in this series have been developed particularly for use in aircraft turbines, these are Jethete M.160, and Jethete M.210. The latter is the most recent introduction and has a 12% Cr-Ni-Mo-Co-B composition.

INSTRUMENT SYMPOSIUM.—The College of Aeronautics, Cranfield, is organizing a symposium on flight test instrumentation from April 7 to April 9. The object is to bring together the users and manufacturers of flight testing equipment so that views may be exchanged, standardization achieved, and research and development stimulated.

DISCONNECT COUPLING.—A self-sealing coupling for oxygen supply to aircrew members has been developed by The Hymatic Engineering Co., Ltd., Redditch, for the M.o.A.

PLESSEY RECTIFIER.—A transformer-rectifier designed for use in aircraft has been introduced by the Plessey Co., Ltd. It enables direct current to be obtained from a three-phase, 200-volt, 320-500 c/s AC supply. The design includes the use of two parallel transformer-rectifier circuits. Each transformer output winding is connected to a single rectifier, total number of rectifiers being 36.

MARCONI APPOINTMENT. — Mr. R. E. Burnett, general manager of Marconi Instruments, Ltd., has been elected to the board and appointed managing director of the company.

Aviation Calendar

December 29.—Radar and Electronics Association lecture, "High Quality Sound Broadcasting," by K. R. Sturley, at the Royal Society of Arts, John Adam Street, **London**, W.C.2, at 19.30 hrs.

December 29.—Institute of Transport lecture, "The Work of the Federal Aviation Agency in the U.S.A.," by Thomas T. Center, in the Conference Room, 3rd Floor, Control Tower, **London Airport Central**, at 18.30 hrs.

January 4.—R.Ae.S. Boscombe Down Branch lecture, "Escape from Military Jet Aircraft," by Wg. Cdr. J. Jewell, in the Lecture Hall, A. and A.E.E., **Amesbury**, Wilts, at 17.30 hrs.

January 6.—R.Ae.S. Brough Branch lecture, "The Art of Developing Aero Engines," by A. C. Lovesey, at the Royal Station Hotel, **Hull**, at 19.30 hrs.

January 6.—R.Ae.S. Weybridge Branch lecture, "The Work of Vickers Research, Ltd.," by Dr. J. R. Green, at the Apprentice Training School, Vickers-Armstrongs, Ltd., **Weybridge**, at 18.10 hrs.

January 7.—R.Ae.S. Young People's lecture, "Flying and the Human Machine," by Dr. G. Melvill Jones, at the Royal Society of Arts, John Adam Street, **London**, W.C.2, at 15.00 hrs.

January 8.—Helic. Assn. of Gt. Britain lecture, "The Development and Flight Testing of Helicopters," by G. J. Sansted and A. V. Coles, in the Library, 4 Hamilton Place, **London**, W.1.

January 9.—British Interplanetary Society Film Show in the Lecture Theatre, Science Museum, Exhibition Road, **London**, S.W.7, at 19.00 hrs.

Company Notices

New Companies

Pullman Reizen (London), Ltd. (643,249).—Private co. Reg. Nov. 27. Cap. £100 in £1 shs. Objects: To carry on the business of travel, tourist, passenger passport and visa, railway, shipping and forwarding agents and contractors, etc. Directors: Roland Verleyen (permanent), 4 Rue de Bruxelles, Ostend; Alfred Williams, 42 Viceroy Court, Prince Albert Road, N.W.8; Jane H. Gosling, 1 Rue de Bruxelles, Ostend. Sec.: Jane H. Gosling. Reg. office: 142 Strand, W.C.2.

Francome Engineering Co., Ltd. (643,229).—Private co. Reg. Nov. 27. Cap. £1,000 in £1 shs. Objects: To carry on the business of precision, mechanical, motor, electrical, aeronautical and general engineers, etc. Subscribers are: Bertram R. J. Hearse, Wentworth, Belmont Crescent, Swindon; Sidney F. Francome, 10 Tenzing Gardens, Swindon. Solrs.: Ronald J. Parker, Swindon. Reg. office: Stratton Road, Swindon, Wilts.

OVERSEAS COMPANIES

Skycraft Services, Ltd. (F.4842).—Particulars filed November 26. Cap. £10,000 in £1 shs. Reg. in Republic of Ireland on November 4, 1958, to carry on the business of aircraft manufacturers, aerodrome proprietors, aircraft charterers, etc. British address: 8 Dornton Road, South Croydon, and at Southend Airport. Royston W. Lea, 8 Dornton Road, South Croydon, is authorized to accept service of process and notices. The directors are: Shirley H. E. Lewis, Weston Bailey, Howth, Dublin; Margaret D. Yates, 6 Woodbine Avenue, Blackrock, Co. Dublin; Jocelyn I. Yates, 6 Woodbine Avenue, Blackrock, Co. Dublin (Director of Weston, Ltd.).

INCREASE OF CAPITAL

Cumberland Aviation Services, Ltd. (625,586).—10 Victoria Place, Carlisle. Increased by £10,000 in £1 ord. shs., beyond the reg. cap. of £8,000.

Birth Notices

Adams.—On December 7, at Leeds, to Suzanne, wife of Flg. Off. J. W. C. Adams, R.A.F.—a daughter.

Brice.—On December 4, at Hereford County Hospital, to Elizabeth (*née* Pinwill), wife of Sqn. Ldr. R. Brice, R.A.F. (retd.)—a daughter.

d'Albiac.—On December 4, to Pamela (*née* Walshe), widow of Flt. Lt. C. H. F. d'Albiac—a daughter.

de Belder.—On November 24, at R.A.F. Akrotiri, Cyprus, to Elizabeth, wife of Sqn. Ldr. K. R. J. de Belder, R.A.F., F.R.C.S.—a daughter.

Hooper.—On December 6, at R.A.F. Hospital, Wroughton, to Elizabeth (*née* Oates), wife of Flt. Lt. T. Hooper—a son.

Lloyd.—On December 7, at R.A.F. Cosford, to Pamela (*née* Woodside), wife of Sqn. Ldr. T. Lloyd of R.A.F., Ternhill—a son.

Martindale.—On December 6, at Imtarfa, Malta, to Eileen (*née* Wrenn), wife of Flt. Lt. A. R. Martindale, R.A.F.—a daughter.

Mullinger.—On December 8, at R.A.F. Hospital, Nocton Hall, to Anne (*née* Devis), wife of Flt. Lt. G. Mullinger, R.A.F.—a son.

What goes on underneath?

To fuel big jet airliners like the Boeing 707 or Douglas DC-8 at the high rates for which they are designed, Shell has developed the 'Tagus' hydrant dispenser. This new fuelling unit can deliver up to 600 gallons of fuel per minute or, if necessary, two dispensers can be used simultaneously to give a total fuelling rate of 1,200 gallons per minute. The 'Tagus' can be parked directly underneath the fuelling points in the wing and, by standing on the dispenser's top deck, the operator has easy access to the aircraft fuel connexions. The 'Tagus' includes a relaxation tank to disperse electrical charges generated by fuel flowing at high speed through the microfilter, and a shock-alleviator guards against pressure surges in the hydrant fuel lines. A pressure control valve maintains the fuelling pressure required by each type of aircraft under all conditions of fuel flow. A secondary delivery system incorporated in the 'Tagus' makes it equally suitable for fuelling all other types of turbine-engined aircraft.

SHELL

you can be sure of Shell

CLASSIFIED ADVERTISEMENTS

PRESS DAY: Classified Advertisements must normally be received at Head Office by FIRST POST THURSDAY for the following Friday week's issue. Last-minute additions and deletions are accepted by telephone from trade advertisers up to noon. Advertisements received too late for a particular issue are automatically inserted in the succeeding one unless instructions to the contrary are received.

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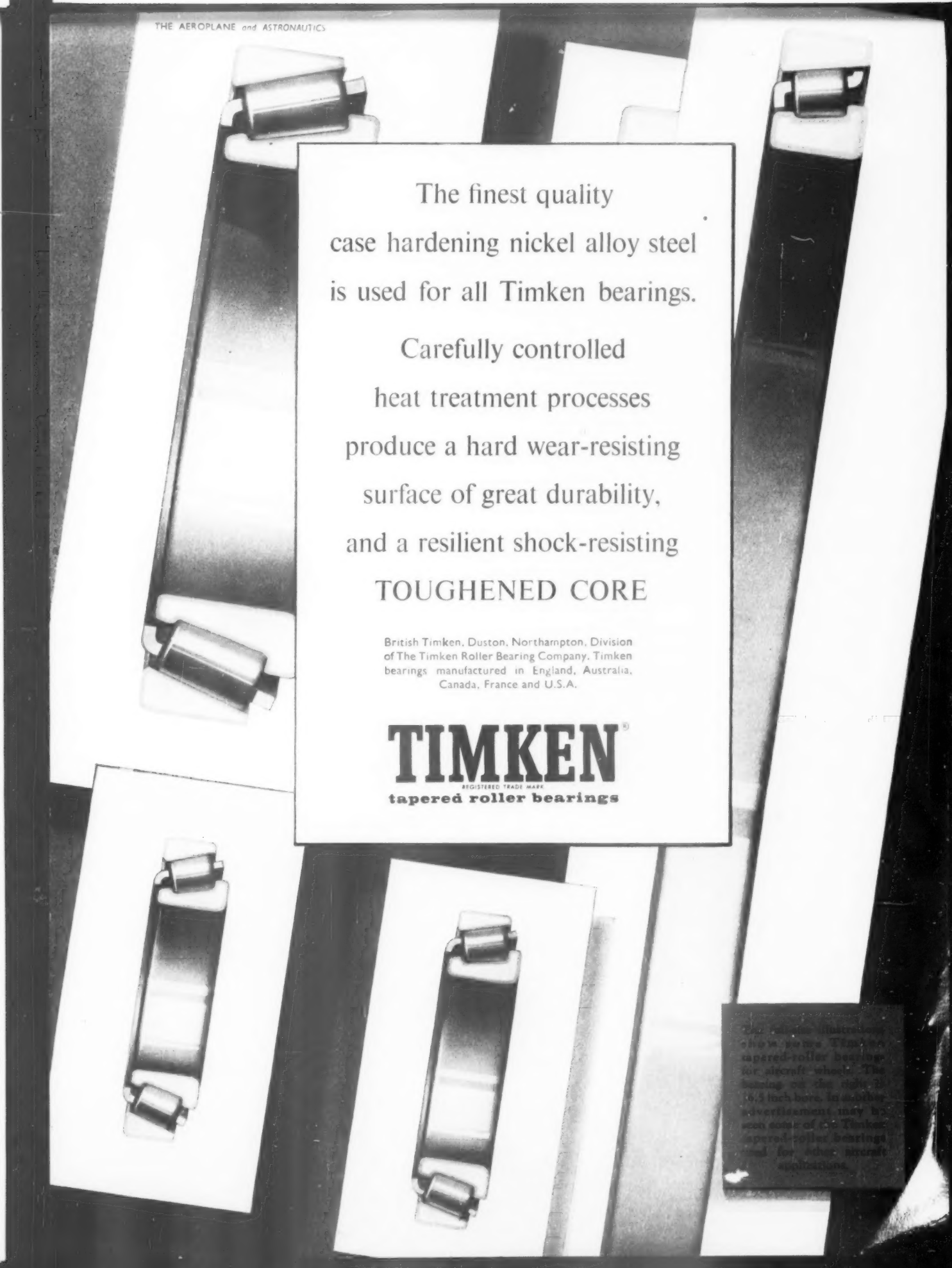

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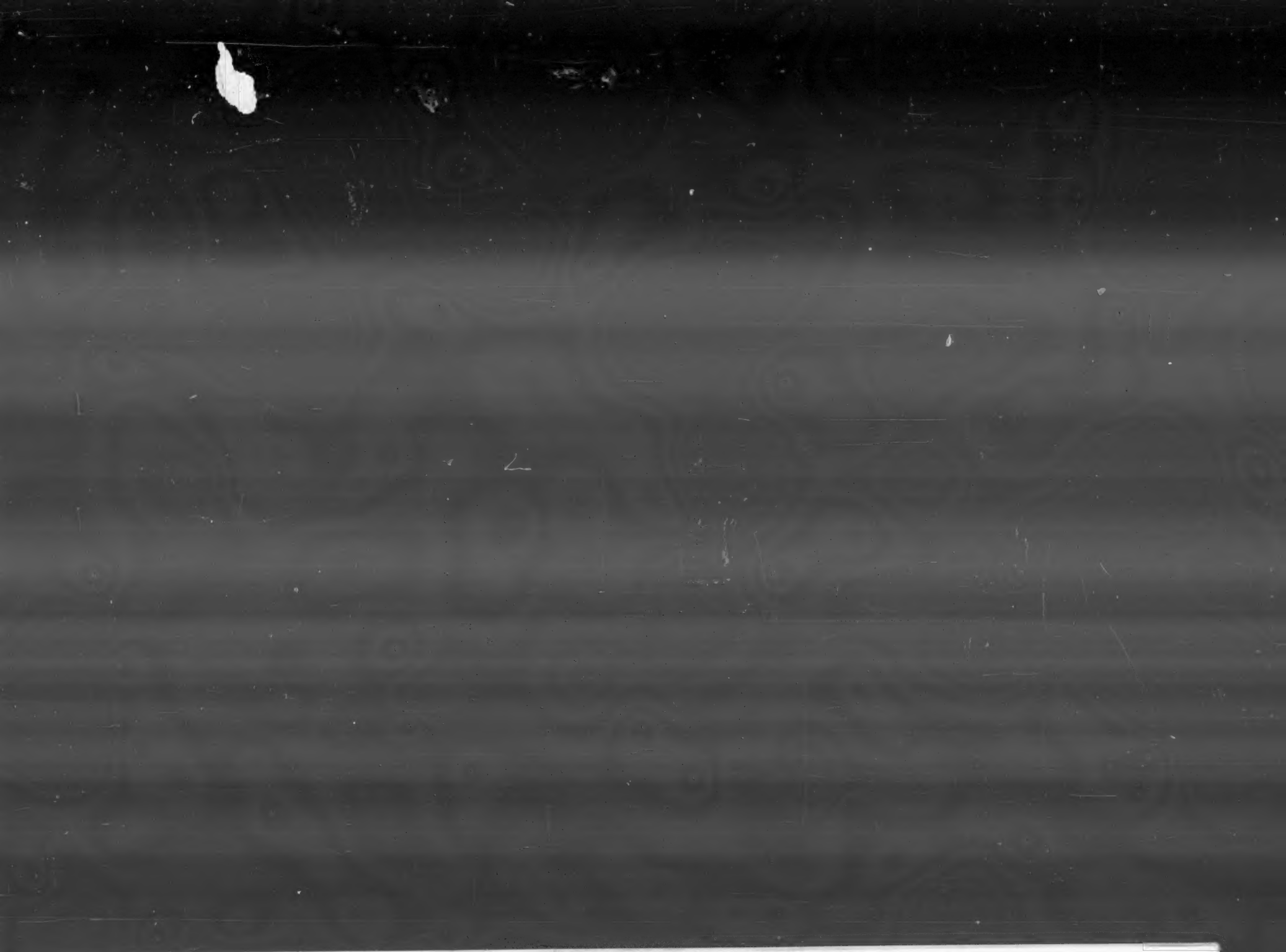
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